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GROUTED PILE STUDY AT CRANBERRY JCT NANTICOKE GS - LONGWOOD TS

Report 90-201-K

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ABSTRACT

A field study to evaluate the suitability of grouted piles for transmission tower foundations was performed. The grouted piles were assessed in terms of the installation procedure and its foundation performance subjected to uplift loads. Two types of grouted piles, the H-pile and the pipe-pile, were evaluated and compared with conventional (ungrouted) H-pile foundations at Cranberry Jct. Difficult soil conditions were encountered consisting of a deep deposit of loose to compact sand with a high water table. Both the grouted pipe-pile and the grouted H-pile developed uplift capacities more than double that of the conventional H-pile with the same embedment length at the Cranberry test site. The grouted H-pile is recommended as a viable TL foundation in weak soils due to the significant improvement in its foundation performance with minor modifications to the construction procedure.

job	file	date	report no.
43-107-431	843.12	September 28, 1990	90-201-K

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To Dr. M.S. Nashid
Manager
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Attention: Mr. H. Dey

1.0 INTRODUCTION

A common foundation used to support high voltage transmission towers is the drilled pier or caisson. Drilled piers can resist large uplift, compression, and lateral loads imposed by the transmission tower. However, drilled pier construction is not feasible for all soil conditions. In difficult soil conditions, a group of conventional steel H-piles with a reinforced concrete cap is typically used.

The uplift capacity of a pile is determined by the skin friction mobilized between the soil and pile surface. For non-displacement piles such as H-piles and open-ended pipe-piles, the skin friction developed in loose to compact granular soils is significantly less than in denser soils. Therefore, to support medium and heavy angle towers, a large number of conventional H-piles is required in difficult soil conditions as encountered at Cranberry Jct.

As an alternative to conventional H-pile construction, two types of grouted piles were installed at Cranberry Jct to evaluate this new approach. In Europe (Holland and Germany), large-diameter, grouted pipe-piles are routinely used as transmission tower foundations/1/. The Fundex Pile Company of Holland has a special rig for installing large diameter piles to great depths in alluvial deposits. The grouted pile is installed in-line with the tower leg to avoid bending stresses in the leg members. With the tower leg directly connected to the grouted pile or embedded in a concrete plug, the concrete pile cap can be eliminated using this approach. The concept of grouted pile foundations is depicted in Figure 1. A previous field test program with 0.5 m diameter grouted pipe-pile (MV pile) was performed at a site 2 km east of Cherrywood SS along the Ontario Hydro right-of-way, Cherrywood SS to Wilson Jct. These test piles developed an allowable uplift capacity of up to 1000 kN in firm to stiff clays/2/. The pile alignment during driving was difficult to maintain through the dense layers. Modification to the pile guide was necessary should a single grouted pile per tower leg be used such that the finished pile head position was within the tolerances of the tower base geometry.

2.0 TEST PROGRAM

The objective of the present study was to increase the ultimate uplift capacity of driven piles, and consequently, to reduce the number of piles required to support a high voltage transmission tower. The feasibility of grouted H-piles and pipe-piles compared to conventional H-piles was investigated.

Three test piles were installed to a common depth of 21 m and static uplift load tests were performed as follows; a conventional H-pile (HP 310x79), a grouted H-pile (modified HP 310x79), and a grouted pipe pile (219 mm O.D.). Table I summarizes the material specifications of the test piles. Figure 2 shows the modification details of the grouted H-pile and the grouted pipe-piles to allow for continuous grouting during the pile driving operation.

A modification to the pile tip for the grouted H-pile was fabricated in the field by cutting the pile flanges to a 60° cone followed by welding 12 mm thick steel plates and stiffeners to the flanges. In addition to this minor modification of the pile tip, two grout lines were fastened on opposite sides of the pile webbing as shown in Figure 2.

For the grouted pipe-pile, an enlarged pile tip or driving shoe with a 60° taper was fabricated from steel stock. This drive shoe was welded to the pipe-pile. A grout collar (356 mm O.D.) was welded to the enlarged pile tip to protect the grout lines during pile driving. Figure 2 shows the details of the enlarged pipe-pile tip and grout line arrangements.

2.1 Test Site

Along the newly constructed transmission line from Nanticoke GS to Longwood TS near Cranberry Jct, a deep deposit of loose to compact sand with a high water table was encountered. A cluster of 25 conventional H-piles (HP310-79) per tower leg was required to support the Z1H type tower (Tower 290) at this location. These production piles were driven to an average refusal depth of 27 m of which 10 m penetrated into a dense to very dense sandy silt (till-like) deposit at depth. The three test piles, in plan-view, are located north of Tower 290 (Figure 3).

Two borehole investigations were performed to depths of 27 m and 32 m at the test site to identify the soil stratigraphy and to obtain soil strength parameters. Figures 4 and 5 show the soil stratigraphy and the continuous standard penetration test results for boreholes #1 and #2 respectively.

The general soil stratigraphy at the test site consisted of a high water table with a deposit of loose to compact sand, to a depth of 17 m, overlying a dense to very dense sandy silt (till-like) deposit to 27 m. The three test piles were driven through the sand into the underlying sandy silt deposit to a depth of 21 m. The shear strength of the cohesive layers and the angle of internal friction for granular soil was also estimated by flat plate dilatometer testing performed at the site and summarized in Table II.

2.2 Installation

The three test piles were driven by a crane-mounted diesel hammer (Delmag D16-32) (Figure 6). In the case of the two grouted test piles, a continuous grouting operation occurred simultaneously as the test pile was driven into the ground. During pile driving, the enlarged pile tip created an annular ring between the pile and soil. By simultaneously grouting during pile driving, a continuous grout column is maintained as the annular space around the pile is filled.

The grouting arrangement consisted of a mobile 2 cubic meter capacity grout plant equipped with a shear mixer, a holding tank, and a screw-type pump (Moyno 3L8) (Figure 7). This grouting plant was rented from Groundation Engineering along with an operator. The prebagged grout mix was formulated with Type 10 cement and fly ash (4:1 ratio by weight) and a retarder (Reset 0.35% by weight of solids) to meet the requirements of workability, working time, and strength. The physical properties of the trial mixes are summarized in Appendix I. A water/cement and fly ash ratio of 0.45 was suitable to meet the requirements of workability and strength. Due to cold weather conditions, the mixing water was preheated to approximately 35°C to 45°C prior to batch mixing in the grout plant.

The flexible twin grout lines attached to the test piles were connected by a Y-connector to a single grout line from the Moyno pump (Figure 7). On each limb of the grout lines, a pressure gauge was connected to monitor the pumping pressure for any possible blockage in the grout line. A sudden build-up of grouting pressure or a drop in the grout column at ground surface would indicate possible

collapse of the grout line or blockage due to caving of the soil. Typically, the grouting pressures measured were 70 to 100 kPa. The high-pressure (rated 100 psi) grouting lines were connected to the Moyno pump by adaptors and quick connectors.

For the grouted pipe-pile, one of the grout lines was initially damaged at a depth of 5 m below grade. Grouting below that depth continued with only one functional grout line for the remainder of the installation. As the grouted pipe-pile was driven to a depth of 10 m, further installation delays occurred due to the blockage experienced by the one grout line. It was suspected that soil caving damaged the grout line which occurred at a depth of 5 m. The grouted pipe-pile was off-plumb by 1.85° with respect to the vertical. Installation of the grouted pipe-pile, consisting of grouting, driving, and splicing operations, took 3 hours to reach a final depth of 21 m.

The grouted H-pile was installed to a final depth of 21 m in about 2 hours without any delays from the grouting or the driving operations. The conventional H-pile was installed to the same depth in about 1 hour.

At various stages of the installation for the grouted piles, grout samples from the Moyno pump and from the grout column which encased the pile in the ground were taken for subsequent testing and inspection. The grout properties of these field samples were similar to the previous laboratory measurements of strength, unit weight, and shrinkage (Appendix I).

The driving records of the three test piles and the standard penetration testing values are summarized in Figure 8. The driving resistance for the grouted H-pile was generally greater than the conventional H-pile; particularly at the dense layers encountered at 4 to 7 m and at depths greater than 18 m. The difference in the driving behaviour can be attributed to the amount of soil displacement during driving, ie. the grouted H-pile with the enlarged tip is a full displacement pile while the conventional H-pile is a non-displacement pile with a thin "H"-shaped cross-section.

The driving resistance of the grouted pipe-pile (open-ended) was similar to the conventional H-pile and was less in resistance than the grouted H-pile. The open-ended, grouted, pipe-pile with an enlarged driving shoe acted as a "partial" displacement pile during driving. At the end of driving, the open-ended, grouted, pipe-pile was about two thirds filled with soil.

For loose to compact sands at a depth of 10 to 18 m, the driving resistance of both grouted piles was similar to or less than the conventional H-pile. By grouting an annular space between the pile and the void created by the enlarged driving shoe, the grout acted as a lubricant at the interface of the pile and soil, thereby reducing the driving resistance.

3.0 Load Testing

In preparation for the static uplift load tests, a stick-up of 30 cm above ground for each test pile was left. A 50 mm thick square steel plate with a threaded centre hole (50 mm diameter) was welded to the pile head of each test pile. A pulling rod was attached to this adaptor plate. The uplift load was applied by a 300 ton capacity, hollow ram, hydraulic jack (Figure 9). Each test pile was tested in uplift by load steps of 5-10 kN with a hold period of 5 to 15 minutes depending on the creep movements observed. The rate of creep under each load increment was also monitored to determine incipient failure. Details of the testing arrangement, methodology, and results are contained in Appendix II.

A load cell monitored the applied loads of the hydraulic jack during testing. A set of electronic displacement transducers were used to measure the following: the pile head movement, the slippage between the steel pile and grout, and the slippage between the grout column and surrounding soil mass

(Figure 9). The load and displacements were continuously monitored by a field data acquisition system consisting of a Campbell Scientific data logger, a desktop PC, and a printer. This system provided real-time load-deflection curves and telltale movements during testing.

4.0 DISCUSSION OF TEST RESULTS

The maximum uplift loads applied to each test pile and the corresponding uplift movements are summarized in Table III. The load-deflection curves for the three test piles; conventional H-pile, grouted H-pile, and grouted pipe-pile; are shown in Figures 10 to 12 respectively. The telltale movements monitored in the soil mass during the respective uplift tests are shown in Figures 13 to 15. The set of telltales which were installed in the surrounding soil mass to a depth of 1 m indicated some ground heave adjacent to the test pile within the zone of influence of approximately three pile diameters.

The installation of the grouted piles required minor modifications to the conventional piling practice. The adaptations made for the pile tip and grouting lines to the grouted H-pile were less than for the grouted pipe-pile. The grouted H-pile was installed without driving or grouting problems as encountered by the grouted pipe-pile. The use of a cement grout supplied by a ready-mix truck would further enhance the installation procedure by minimizing the batch handling of the grout material. The total volume of grout used was 2.7 m^3 and 2.4 m^3 for the grouted H-pile and pipe-pile respectively. This corresponds to approximately 1 m^3 to 0.7 m^3 per 10 m length of grouted pile depending on the type; H-pile or pipe-pile. The importance of quality control and inspection of the grout is required to ensure that full pile capacity is obtained.

The grouted pipe-pile failed prematurely due to bond slippage between the steel pile and grout column (Figure 12). However, prior to the pile-to-grout bond failure, the pile deflection response of the grouted pipe-pile was less than the conventional H-pile under comparable loads. Due to the discontinuity in the grout column as a result of grouting problems during installation, a poor steel-to-grout bond may have resulted. Either a void or an intrusion of loose sand formed in the grout column at a depth of 5 to 10 m. Consequently, during the static uplift load test, slippage between the steel pile and grout occurred. Therefore, it is important to protect the grout lines during pile driving and to monitor the grout volumes and the pumping pressures during installation.

Better protection of the grouting lines on the grouted pipe-pile is required; such as a 5 m long section of solid, steel pipe at the pile tip or extending the grout collar to 1 m length on the pile. Also, increasing the thickness of the annular grout column would maintain an adequate grout head to prevent soil caving and/or intrusion/contamination. In the case of the grouted H-pile, the grout lines were well-protected between the pile flanges and a sufficient volume of grout was present to maintain a constant head to prevent soil caving and/or soil intrusion/contamination.

4.1 Uplift Capacity and Skin Friction

The uplift resistance for grouted and conventional piles is developed from the mobilized skin resistance between the pile surface and surrounding soil mass. In order to compare the uplift capacities of the grouted and conventional piles with the same embedment depth in the same soil deposit, two major factors need to be considered as follows; the differences in the total surface area of the pile-soil contact, and the effects of the pile penetration into the surrounding soil. For a grouted pile which acts as displacement piles, densification of loose to compact sand occurred during the driving operation, and subsequent development of a soil-to-grout bonding at the interface from the grouting operation.

4.1.1 Comparison of the Pile Capacities

For conventional H-piles using the skin friction values recommended by the Transmission & Distribution design guide (Table IV), the ultimate uplift capacity was estimated to be 836 kN assuming an embedment length of 27 m or 784 kN excluding the upper 3 m of compact sand for the pile cap. The maximum deflection acceptable for these conventional H-piles in uplift is 25 mm. The production H-piles at the test site (Tower 290) were driven to a depth of 27 m based on a refusal criterion with a minimum penetration resistance of 15 blows per 25 mm (personal communique with Mr. F.C. Devisser, D&D Transmission, Transmission Lines Design).

Both the dynamic pile analyzer and the CAPWAP analysis were performed by TROW GEOTECHNICAL LTD. (Project No. G-04206-A/G, Sept., 1989) for two production H-piles at Tower 290 (Legs 3 and 4). From the CAPWAP analysis, the estimated skin friction was in the range of 1000 to 1385 kN. The recommendation by TROW based on the CAPWAP analysis was an allowable load of 910 kN in compression and 470 kN in tension/uplift provided the piles were driven to a minimum penetration resistance of 15 blows per 25 mm and terminated between 26.4 and 27.1 m depth.

From the static load tests performed at the test site by Civil and Mechanical Research, the ultimate uplift capacity was 1200 kN for the conventional H-pile with an embedment length of 21 m. For an uplift resistance of 800 kN, the corresponding pile displacement was 25 mm (Figure 10). The allowable capacity and displacement tolerance compared reasonably well with T&D design predictions of uplift capacities for conventional H-piles in granular soils.

The grouted H-pile resisted a maximum applied load of 2600 kN and did not indicate any slippage between the pile-to-grout interface or between the grout-to-soil interface (Figure 11). The maximum load of 2600 kN applied to the grouted H-pile reached approximately the yield strength of the steel (Grade 300 mPa W). The ultimate uplift capacity of the grouted H-pile was approximately twice the capacity of the conventional H-pile. Also, the uplift movements corresponding to the working load range for the grouted H-pile was quite small (<10 mm) compared to the conventional H-pile. Thus, based on the ultimate uplift capacity and pile deflections at the working load range, the grouted H-pile performed better than the conventional H-pile.

The grouted pipe-pile failed before reaching the expected uplift capacity. A sudden bond failure occurred between the steel pipe-section and the grout column at 1800 kN with 10 mm of pile displacement. The estimated uplift resistance for the grouted pipe-pile was greater than 2000 kN at 25 mm displacement (Figure 12). The grout-to-steel bond failure was attributed to grouting problems encountered between the depths of 5 and 10 m. Better protection of the grouting lines and a slightly larger diameter driving shoe would allow for improved grouting without a further significant increase of the pile driving resistance.

In the case of the grouted pipe and H-piles, the skin friction values recommended in the T&D design guide would not be appropriate to estimate the uplift capacity due to differences in the pile installation procedures of grouting versus not grouting (conventional H-piling). The Ku theory proposed by Meyerhof and Adams/3/ might be an alternative design approach for grouted piles.

As an example, the uplift capacity for the grouted H-pile using the Ku theory approach was estimated (Table IV). The predicted uplift capacity for the grouted H-pile was 2924 kN with a pile embedment depth of 21 m. The prediction by the Ku approach for this grouted H-pile is similar to the ultimate uplift capacity (>2600 kN) obtained from the static load test. The Ku values recommended by Meyerhof and Adams (1968) would appear appropriate for grouted piles due to densification of loose to compact granular soil during pile driving and the in-situ grouting technique for this pile.

However, further analysis and testing needs to be performed prior to recommending the Ku design method for grouted piles. The Ku theory was originally derived from uplift tests performed in granular and cohesive soils for cast-in-place drilled piers.

5.0 CONCLUSION

Grouted piles are a practical approach to increase the pile capacity for transmission tower foundations in difficult soil conditions where a large number of driven conventional H-piles is otherwise required. Depending on the soil conditions, an estimated 50 per cent reduction in the size of a pile group per tower leg can be obtained using grouted piles. From this study, the uplift capacity of both grouted piles were twice that of the conventional (ungrouted) H-piles installed to the same embedment depth. In addition, the corresponding pile displacements in the working load range were smaller for the grouted piles than for the conventional H-pile. The grouted H-pile was modified in the field and did not require prefabrication of a special drive shoe as did the grouted pipe-pile.

Further study of grouted pipes in different soil conditions for TL applications is recommended to optimize a design methodology and analysis, and to develop a production-scale installation procedure.

ACKNOWLEDGMENTS

The assistance and cooperation of the Transmission Lines Construction staff under the supervision by Mr. C. Adams and Mr. J. Kowalczyk during installation and load testing was appreciated. The assistance from Mr. F.C. Devisser, D&D Transmission, is thankfully acknowledged regarding current design practices of TL foundations. Mr. G.A. Senkiw and Mr. D. King, Mechanical Research, assisted in performing the field load testing. Mr. J.J. Deans, Civil Research, provided the necessary design and testing of a suitable grouting mixture for this application. Mr. M.I. Grills and Mr. J.P. Adams, Civil Research, aided in conducting the pile load testing, instrumentation and pile installation.

The combined efforts and talents of these individuals are gratefully acknowledged by the author.

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TABLE I

Test Pile Materials

PILE TYPE	SECTION	GRADE	STANDARD
H-Pile	HP310 x 79	300 MPaW	CSA.G - 40.21
Pipe	219 mm O.D. 12.7 mm thick wall 64.4 kg/m	350 MPaW	ASTM A-36

PILE DRIVER

DELMAG D 16-32
Rated Energy 1180 - 2470 (kg.m)
Hammer Weight 3250 kg.
*Driving Setting #3

TABLE II
Flat Plate Dilatometer Test Results
Cranberry Jct.

DEPTH (m)	SOIL TYPE	UNDRAINED SHEAR STRENGTH (C_u*)kPa	ANGLE OF INTERNAL FRICTION (ϕ)*
1.83	Compact	--	35.4
2.13	Silty Sand		37.1
2.44	"		35.4
2.74	"		34.2
3.05	"		33.9
3.35	"		34.1
3.66	"		35.2
3.96	"		32.6
4.27	"		33.5
4.57	"		35.0
4.88	"		33.0
Augered to 10.97 m. No tests			
10.97 11.28 11.58 11.89	Loose Silty Sand to Sandy Silt		27.8 30.0 30.5 29.4
12.19	"		30.0
12.50	"		30.7
12.80	"		31.1
			29.5
14.02	"		28.5
14.32	"		29.7
14.63	"		27.2
15.24 15.54 15.85	Clayey Silt to Silty Clay	54 72 70	-- -- --
16.15	"	71	--
16.46	"	58	--
16.76	"	47	--

* Soil Parameters estimates by the data reduction procedures developed by Marchetti (ASCE J-GED, March 80)

TABLE III

Summary of Pile Uplift Load Test Data

PILE NUMBER	TYPE OF PILE	MAXIMUM LOAD APPLIED (kN)	MAXIMUM UPLIFT (mm) PILE	MAXIMUM UPLIFT (mm) GROUT	UPLIFT LOAD AT 25 mm UPLIFT (kN)
1	H-Pile	1200*	70	---	800
2	Grouted H-Pile	2600**	12	12	>3000
3	Grouted Pipe-pile	1800***	90	15	-

* Conventional H-pile uplifted continuously at 1500 kN load

** The pile load reached yield strength of steel, but no failure occurred between the soil and grout or between the grout and steel

*** Slip occurred between the pipe-pile and grout

TABLE IV

Soil-Pile Skin Friction/Adhesion Values
Recommended By Transmission & Distribution Design Guide
(TSSI 25100-009)

A. Friction for Granular Soils:		B: Adhesion for Cohesive Soils:
Loose Granular Class II	4.8 kPa	Values of 0.4 times the shear strength values of the soil may be used
Compact Granular Class III	14.4 kPa	For the poorer soils with a shear value of less than 25 kPa a higher factor of 0.6 may be used
Dense Granular Class IV	28.7 kPa	
Very Dense Granular Class V	38.3 kPa	
Extremely Dense Granular Class V	101.5 kPa	

The above values are for use with the maximum tower reactions including an appropriate footing overload factor. Pile overload factors (see below) will allow for undetectable variations in the soil.

Overload Factors

A pile overload factor of 2.0 is recommended at locations with soil profiles and without pile tests. It is suggested that this may be reduced to 1.5 where pile testing and soil profiles are available.

TABLE V

Estimation of the Pile Capacity Using the Ku Theory

Soil Layer	Depth (m)	Uplift Capacity Grouted H- Pile
1. compact sand Av. N = 30 γ' = 10 kN/m^3	0 11	Ku = 2.0 ϕ = 30° Pu = 483 kN
2. loose sand Av. N = 8 γ' = 9 kN/m^3	 15	Ku = 1.0 ϕ = 27° Pu = 98 kN
3. stiff clay Cu = 50 kPa γ' = 18 kN/m^3	 18	α = 0.5 Pu = 91 kN
4. very dense sand Av. N = 100 γ' = 10 kN/m^3	 21	Ku = 3.0 ϕ = 40° Pu = 2252

Total Uplift Capacity 2924 kN

Assumptions: (1) Nominal cylindrical shear surface with diameter, B = 0.3 m
(2) Steel-sand interface, δ - $\frac{3}{4}\phi$
(3) No critical depth due to installation procedure (ie, linearly increasing effective overburden stress, σ'_v with depth)
(4) Effective unit weight of soil, γ, assuming water table at the ground surface

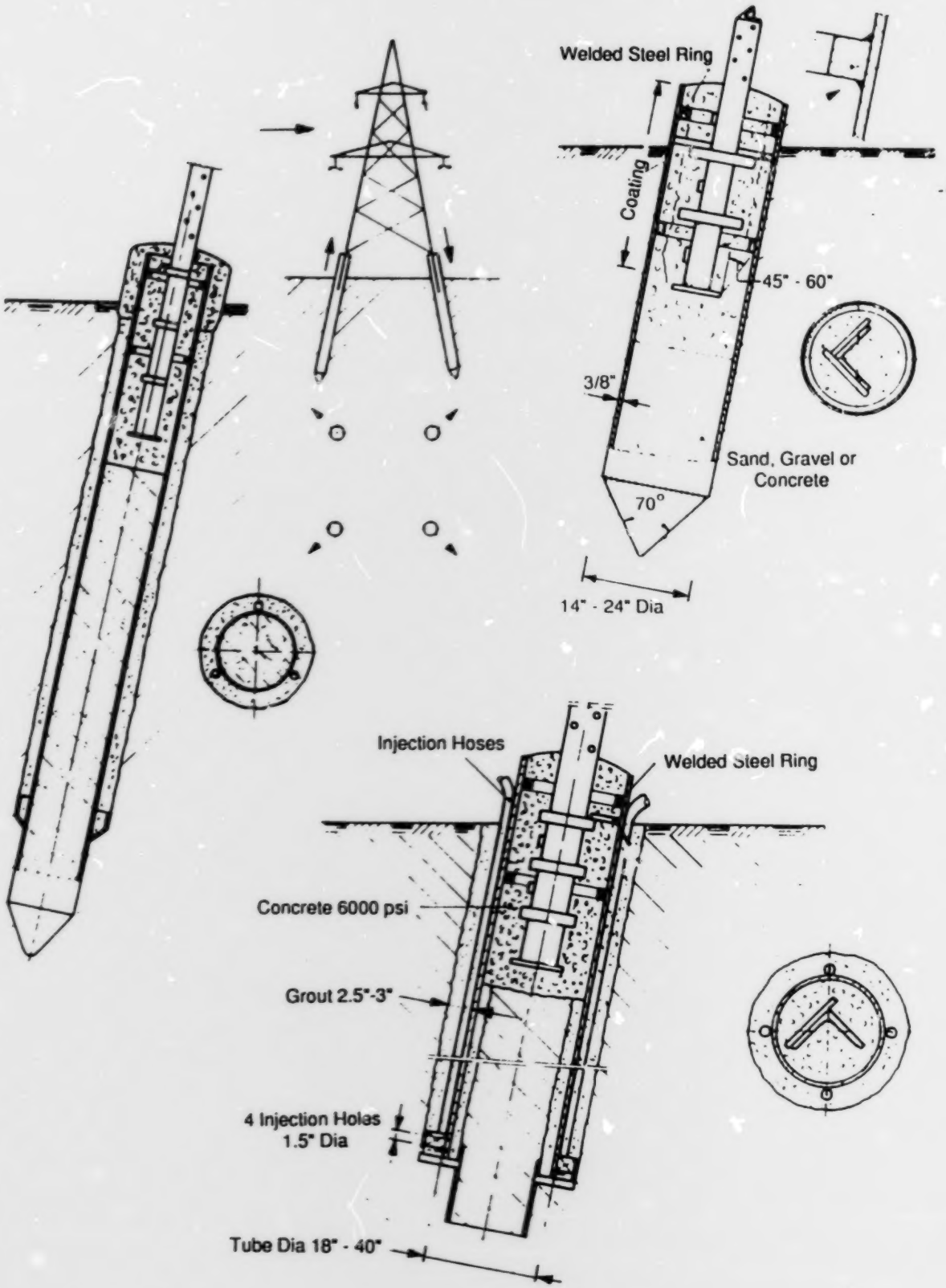

FIGURE 1

HIGH CAPACITY GROUTED PIPE PILE FOR TRANSMISSION TOWER FOUNDATION/1/

183567-RD

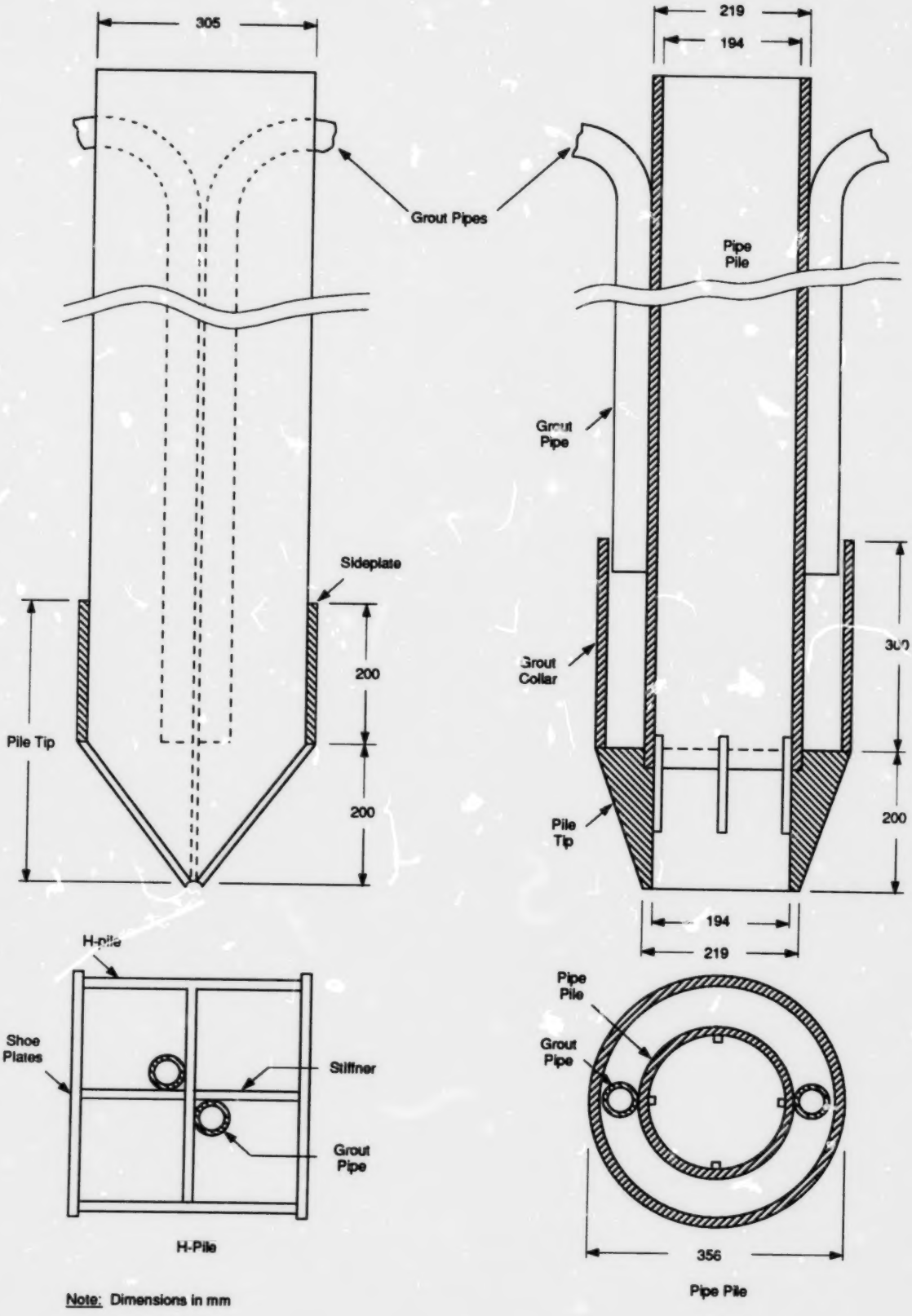

FIGURE 2

DETAILS OF GROUTED PILES

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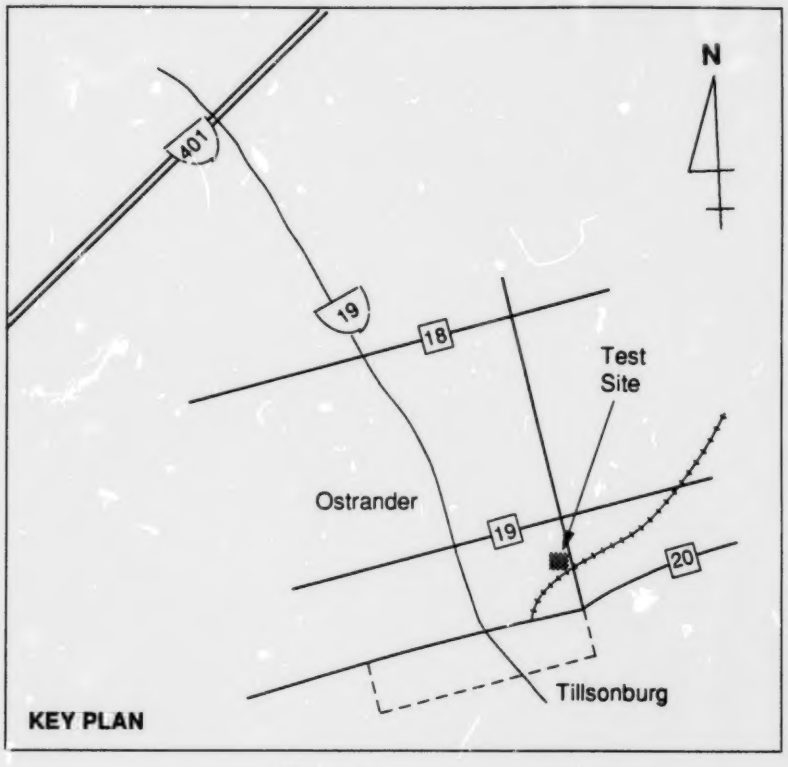

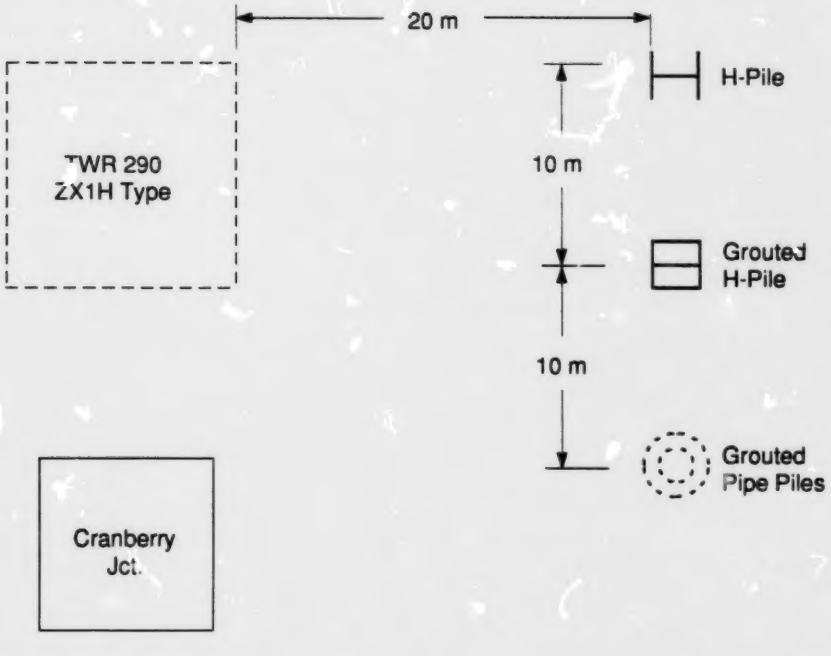

FIGURE 3

TEST PILE LAYOUT

PROJECT GROUTED TEST PILE STUDY — HOLE TYPE 'NW' CASING — OBSERVER M. GRILLS

LOCATION CRANBERRY JCT.TWR #290 — HOLE SIZE 8.90 cm — COMPILED M. GRILLS

BOREHOLE #1 — DIP 90° — DRILLED NOV. 6, 1989 — CHECKED R. TSANG

DATUM — BEARING — DRAWN — APPROVED

BORING DATA						BORING LOG		WATER INF		FIELD TESTS		LABORATORY TESTS					
SCALE-METRES	ELEV / DEPTH	(1) SAMPLE NO	(2) SAMPLE TYPE	(3) 'N' VALUE per 0.3m / RQD-%	(4) WATER LEVEL and CAVING W.R	(5) DESCRIPTION	(6) REMARKS	(7) OBSERVATION WELL DATA	(8) 'k' soil/rock cm/s WATER PRESS TEST	(9) SPECIAL TESTS TYPE	(9) SPECIAL TESTS RESULTS	NATURAL DENSITY kg/m³	MOISTURE CONTENT-%	(10) SHEAR STRENGTH kPa TYPE	(10) SHEAR STRENGTH kPa RESULTS	(11) SPECIAL TESTS TYPE	(11) SPECIAL TESTS RESULTS
						GRAN. 'C' TOP DRESSING											
	0.91	1		11		COMPACT MOIST GREY FINE SAND, SOME SILT (ORGANICS)							35.6				
		2		43		DENSE WET GREY FINE SAND, TRACE OF SILT							23.7				
	2.74	3		16		COMPACT WET GREY FINE SAND, ODD FINE SANDY SILT LAYER							17.2				
		4		24									17.2				
	4.57	5		23		COMPACT WET GREY FINE SAND, LITTLE SILT							20.3				
		6		53		VERY DENSE							17.9				
		7		80									20.2				
	7.31	8		21									23.1				
		9		28		COMPACT WET GREY FINE SAND							22.8				
		10		20													
	10.06	11		10		COMPACT WET GREY SILT, LITTLE FINE SAND							23.3				
		12		7		LOOSE							26.6				
	11.89	13		7		LOOSE WET GREY SILT, LITTLE FINE SAND, ODD STIFF MOIST GREY BLOCKY SILTY-CLAY LAYERS							27.3				
		14		13									24.9				
		15		8									28.0				
		16		6									31.6				
	15.54	17		10		LAYERED, STIFF MOIST GREY SILTY-CLAY AND A WET GREY SILT. (SILTY-CLAY LAYERS ARE THICKER)							25.3				
		18		8									28.5				
	17.37	19		80/.15m		STIFF MOIST GREY SILTY-CLAY CHANGING TO A VERY DENSE MOIST GREY SANDY-SILT, ODD LAYER OF A STIFF MOIST GREY SILTY-CLAY, ALSO A FINE SAND TO FINE GRAVEL LAYER COBBLE/BOULDERS AT APPROX. 17.7 m							28.2				
	19.20	21		50+		VERY DENSE WET SILTY-FINE SAND, LITTLE MEDIUM SAND TO FINE GRAVEL, ODD POCKET/LAYER OF A STIFF MOIST GREY SILTY-SAND							31.4				
		22		50+									12.1				
	21.03	23		142		VERY DENSE MOIST GREY SANDY-SILT, LITTLE FINE GRAVEL (TILL-LIKE)							21.0				
		24		68+									22.8				
		25		80+									3.7				
													8.4				
													10.2				

ONTARIO HYDRO
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GEOTECHNICAL DATA SHEET

hole no VC-290 — Fig 4

sheet 1 OF 2

90-201

201067 RD

PROJECT GROUTED TEST PILE STUDY — HOLE TYPE 'NW' CASING — OBSERVER M. GRILLS

LOCATION CRANBERRY JCT. TWR #290 — HOLE SIZE 8.90 cm — COMPILED M. GRILLS

BOREHOLE #1 — DIP 90° — DRILLED NOV. 6, 1989 — CHECKED R. TSANG

DATUM — BEARING — DRAWN — APPROVED

BORING DATA						BORING LOG	WATER INF.		FIELD TESTS		LABORATORY TESTS				
SCALE-METRES	ELEV / DEPTH	(1) SAMPLE NO	(2) SAMPLE TYPE	(3) 'N' VALUE per 0.3m / RQD-%	(4) WATER LEVEL and CAVING W.R	(5) DESCRIPTION / CONTINUED	(6) REMARKS	(7) OBSERVATION WELL DATA	(8) 'k' soil/rock cm/s / WATER PRESS TEST	(9) SPECIAL TESTS TYPE	(9) SPECIAL TESTS RESULTS	NATURAL DENSITY kg/m³	MOISTURE CONTENT-%	(10) SHEAR STRENGTH kPa TYPE	(10) SHEAR STRENGTH kPa RESULTS	(11) SPECIAL TESTS TYPE	(11) SPECIAL TESTS RESULTS
		25				SEE PAGE 1											
	23.77	26		102+		CUTTINGS FROM COBBLES/BOULDERS							- -				
	24.68	27		179+		VERY DENSE MOIST GREY FINE TO COARSE SAND, SOME FINE GRAVEL							6.9				
	25.05					END OF BOREHOLE											

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GEOTECHNICAL DATA SHEET

hole no VC-290 — Fig 4 (cont'd)

sheet 2 OF 2

90-201
201068-RD

PROJECT GROUTED TEST PILE STUDY — HOLE TYPE 'NW' CASING — OBSERVER M. GRILLS

LOCATION CRANBERRY JCT. TWR #290 — HOLE SIZE 8.90 cm — COMPILED M. GRILLS

BOREHOLE #2 — DIP 90 — DRILLED NOV. 9, 1989 — CHECKED R. TSANG

DATUM — BEARING — DRAWN — APPROVED

BORING DATA						BORING LOG		WATER INF.		FIELD TESTS		LABORATORY TESTS					
SCALE - METRES	ELEV / DEPTH	(1) SAMPLE NO	(2) SAMPLE TYPE	(3) 'N' VALUE per 0.3m / RQD - %	(4) WATER LEVEL and CAVING W.R.	(5) DESCRIPTION	(6) REMARKS	(7) OBSERVATION WELL DATA	(8) 'k' soil/rock cm/s / WATER PRESS. TEST	(9) SPECIAL TESTS TYPE	(9) SPECIAL TESTS RESULTS	NATURAL DENSITY kg/m³	MOISTURE CONTENT - %	(10) SHEAR STRENGTH kPa TYPE	(10) SHEAR STRENGTH kPa RESULTS	(11) SPECIAL TESTS TYPE	(11) SPECIAL TESTS RESULTS
						GRAN 'C' TOP DRESSING											
	0.91	1		29		COMPACT WET GREY FINE SAND, LITTLE SILT											
		2		24									17.2				
		3		27	▽								30.9				
		4		13									23.1				
		5		22									29.9				
		6		56		VERY DENSE							21.7				
		7		58									21.9				
		8		19									22.1				
		9		32									22.3				
		10		24									22.0				
		11		24									22.4				
	11.00	12		8		LOOSE WET GREY SILT WITH A TRACE OF FINE SAND							28.5				
	11.89	13		7		LOOSE WET GREY SILT, TRACE OF FINE SAND, ODD STIFF MOIST GREY SILTY-(COMPACT LAYER)							28.8				
		14		20									25.8				
		15		8		LOOSE							33.0				
		16		8									29.1				
	15.54	17		7		LAYERED, STIFF MOIST GREY SILTY-CLAY AND A LOOSE WET GREY SILT (SILTY-CLAY LAYERS ARE THICKER)							26.0				
		18		8		COBBLES/BOULDERS FROM 17.37 m TO 18.0 m							27.4				
	18.29	19		74+		VERY DENSE MOIST GREY FINE SAND, SOME SILT, LITTLE MEDIUM TO COARSE SAND, ΔT 19.40 m CHANGES TO A FINE SAND TO FINE GRAVEL.							10.8				
		20		126+									12.8				
		21		95		20.0 m TO 21.0 m: GRAVEL, COBBLES, BOULDERS							-				
	21.12	22		114+		VERY DENSE MOIST GREY SANDY - SILT, LITTLE TO SOME FINE GRAVEL (TILL-LIKE)							7.6				
		23		116									7.3				
	22.25					VERY DENSE MOIST GREY SAND, LITTLE SILT AND FINE GRAVEL											
	22.35					CONT'D											

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GEOTECHNICAL DATA SHEET

hole no VC-290 — Fig 5

sheet 1 OF 2

PROJECT GROUTED TEST PILE STUDY — HOLE TYPE 'NW' CASING — OBSERVER M. GRILLS

LOCATION CRANBERRY JCT. TWR #290 — HOLE SIZE 8.90 cm — COMPILED M. GRILLS

BOREHOLE #2 — DIP 90° — DRILLED NOV. 9. 1990 — CHECKED R. TSANG

DATUM — BEARING — DRAWN — APPROVED

BORING DATA						BORING LOG	WATER INF		FIELD TESTS		LABORATORY TESTS					
SCALE - METRES	ELEV / DEPTH	(1) SAMPLE NO	(2) SAMPLE TYPE	(3) 'N' VALUE per 0.3m / RQD - %	(4) WATER LEVEL and CAVING W.R.	(5) DESCRIPTION / (6) REMARKS	(7) OBSERVATION WELL DATA	(8) 'k' soil/rock cm/s WATER PRESS TEST	(9) SPECIAL TESTS TYPE	(9) SPECIAL TESTS RESULTS	NATURAL DENSITY kg/m³	MOISTURE CONTENT - %	(10) SHEAR STRENGTH kPa TYPE	(10) SHEAR STRENGTH kPa RESULTS	(11) SPECIAL TESTS TYPE	(11) SPECIAL TESTS RESULTS
						CONTINUED VERY DENSE WET GREY FINE SAND, LITTLE SILT										
	23.10	24		167		VERY DENSE MOIST GREY SANDY-SILT (TILL-LIKE)						14.1				
	24.08	25		804		VERY DENSE WET GREY SAND, LITTLE FINE GRAVEL						13.6				
	25.00	26		109+		VERY DENSE WET GREY FINE SAND, TRACE OF SILT, ODD PIECE OF FINE GRAVEL						15.5				
		27		75+								20.6				
	26.82	28		124+		VERY DENSE WET GREY SILT, LITTLE FINE SAND						19.2				
	27.74					VERY DENSE WET GREY FINE SAND										
	27.74	29				HARD MOIST GREY SILT, LITTLE CLAY					2048	13.3	u/c	272		
	28.65	30		142+		VERY DENSE WET GREY SILT, SOME FINE SAND						22.0				
	29.56	31		82		VERY DENSE WET GREY FINE SAND, LITTLE MEDIUM SAND TO FINE GRAVEL						11.4 17.6				
	29.84	32		86		VERY STIFF MOIST GREY SILTY-CLAY					2066	16.1	u/c	152		
	30.63					END OF BOREHOLE										

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GEOTECHNICAL DATA SHEET

hole no VC - 290

Fig 5 (cont'd)

sheet 2 OF 2

201066-RD 90-201

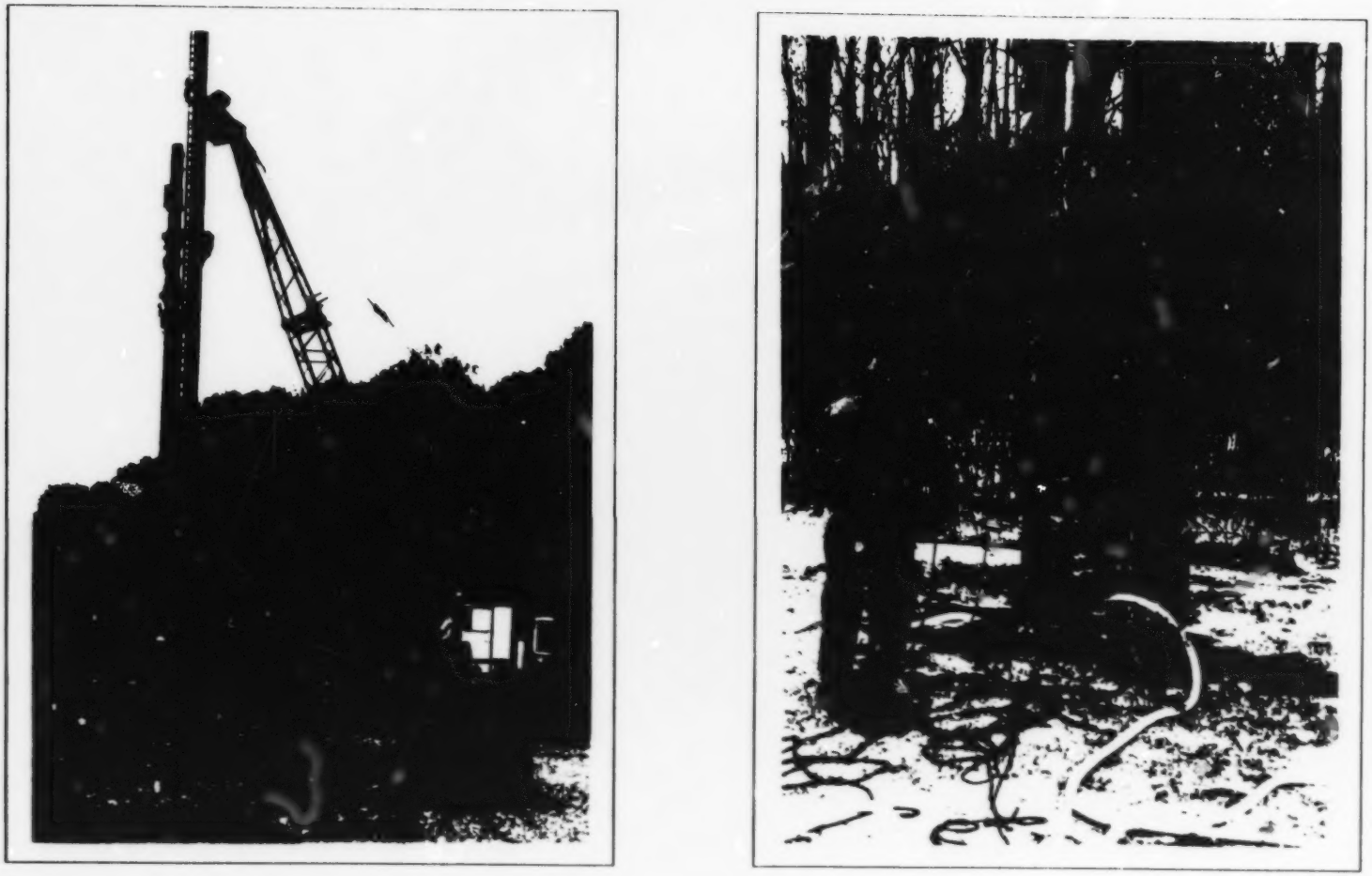


FIGURE 6

DRIVING OF TEST PILES AT CRANBERRY JCT.
USING DIESEL HAMMER D16-32

38 mm Clear Plastic Grout Lines

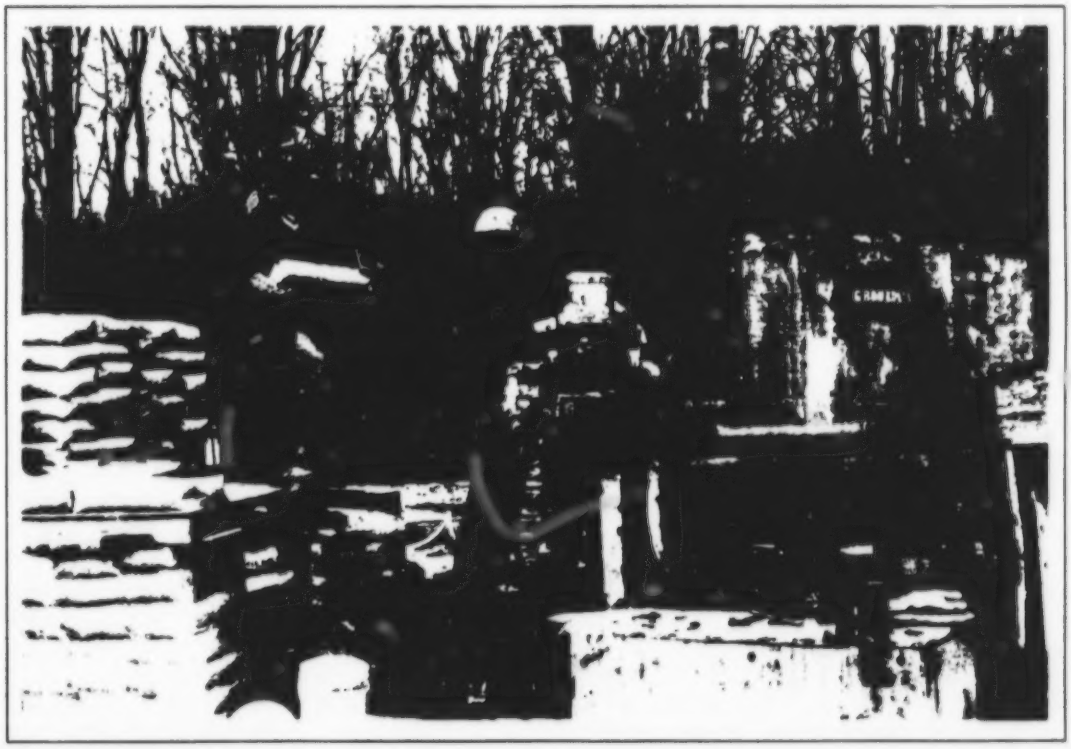


FIGURE 7

GROUTING ARRANGEMENT USING
A MOBILE GROUT PLANT AND PRE-BAGGED CEMENT

183376-B20-RD

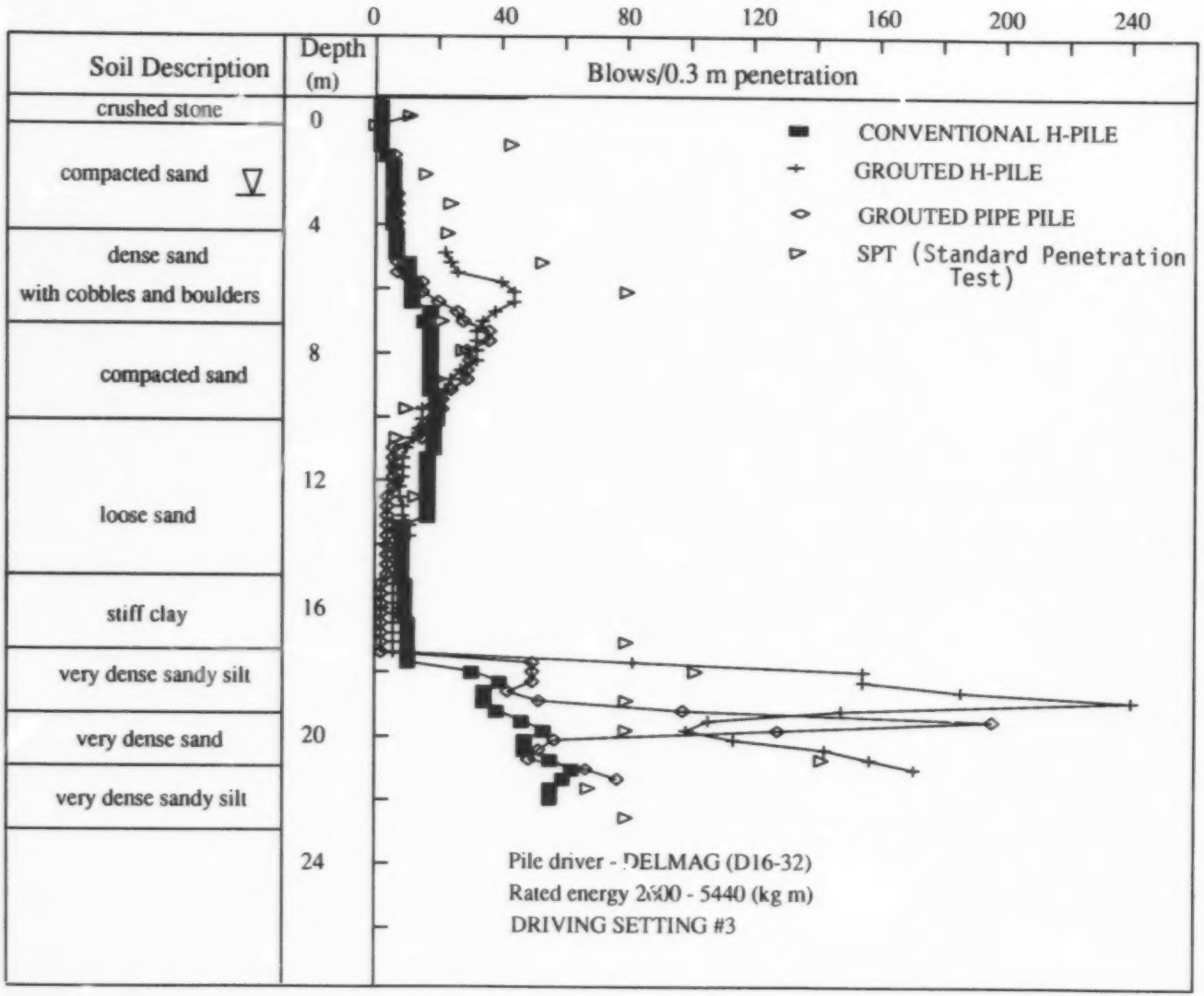
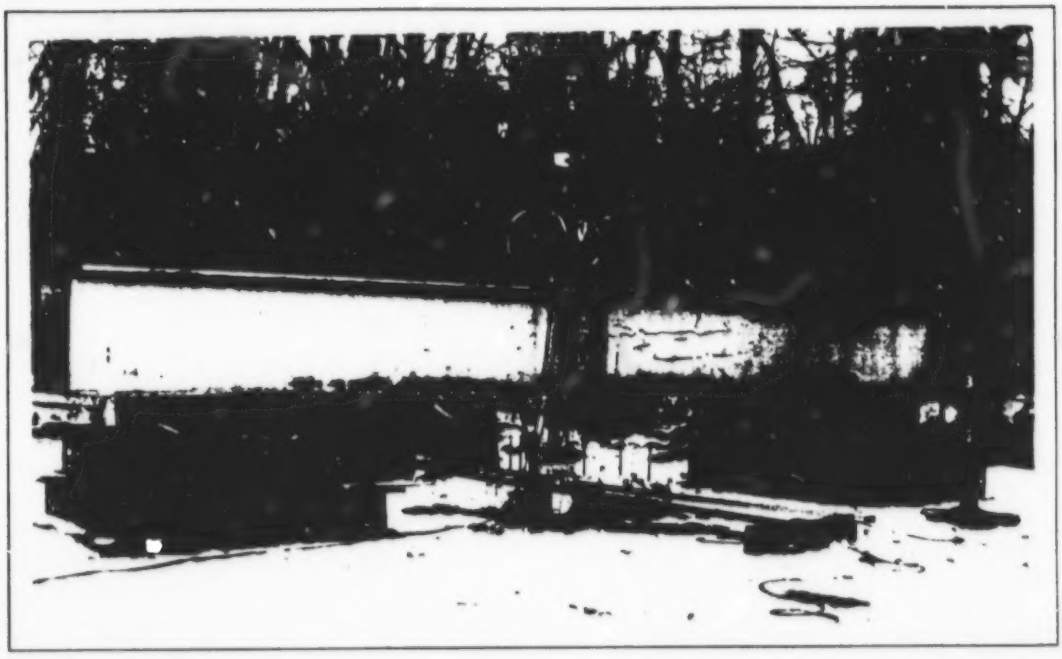


Figure 8 DRIVING RECORD OF THREE TEST PILES



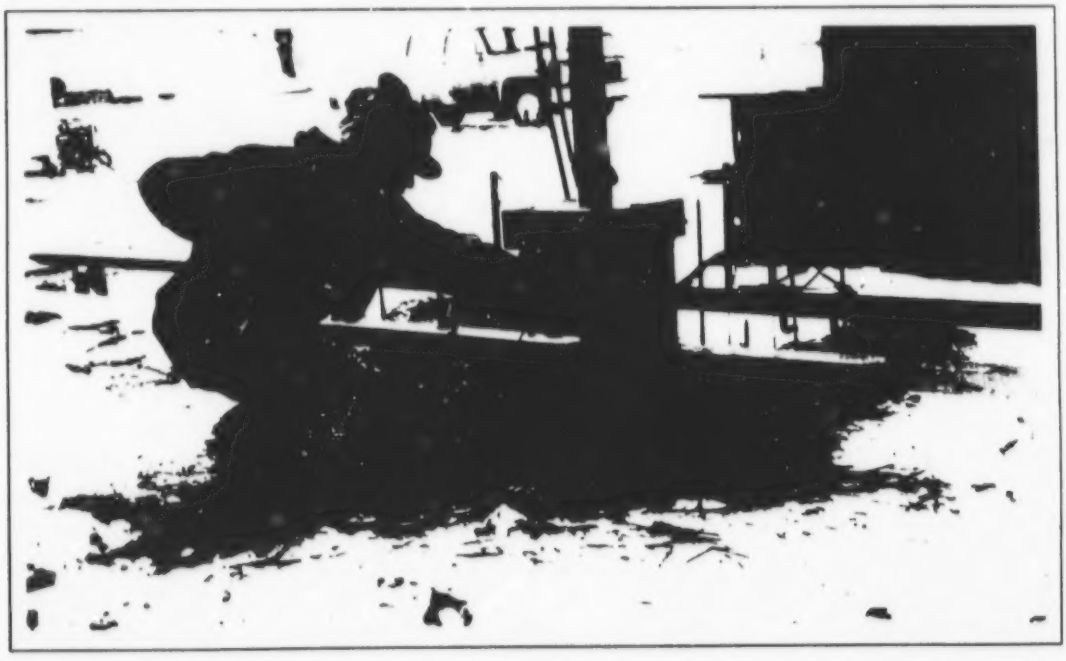


FIGURE 9
UPLIFT LOAD TEST ARRANGEMENT

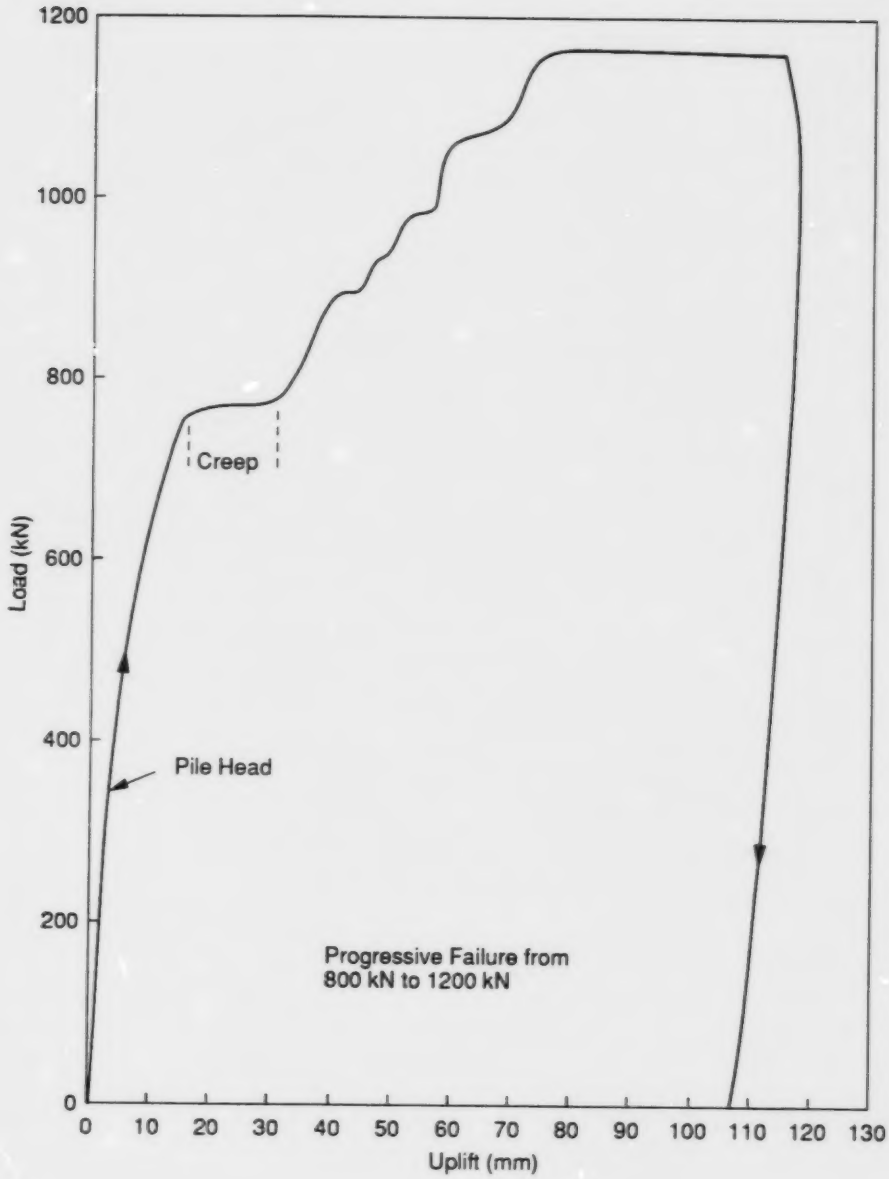


FIGURE 10

LOAD-DISPLACEMENT CURVE FOR CONVENTIONAL (UNGROUTED) H-PILE

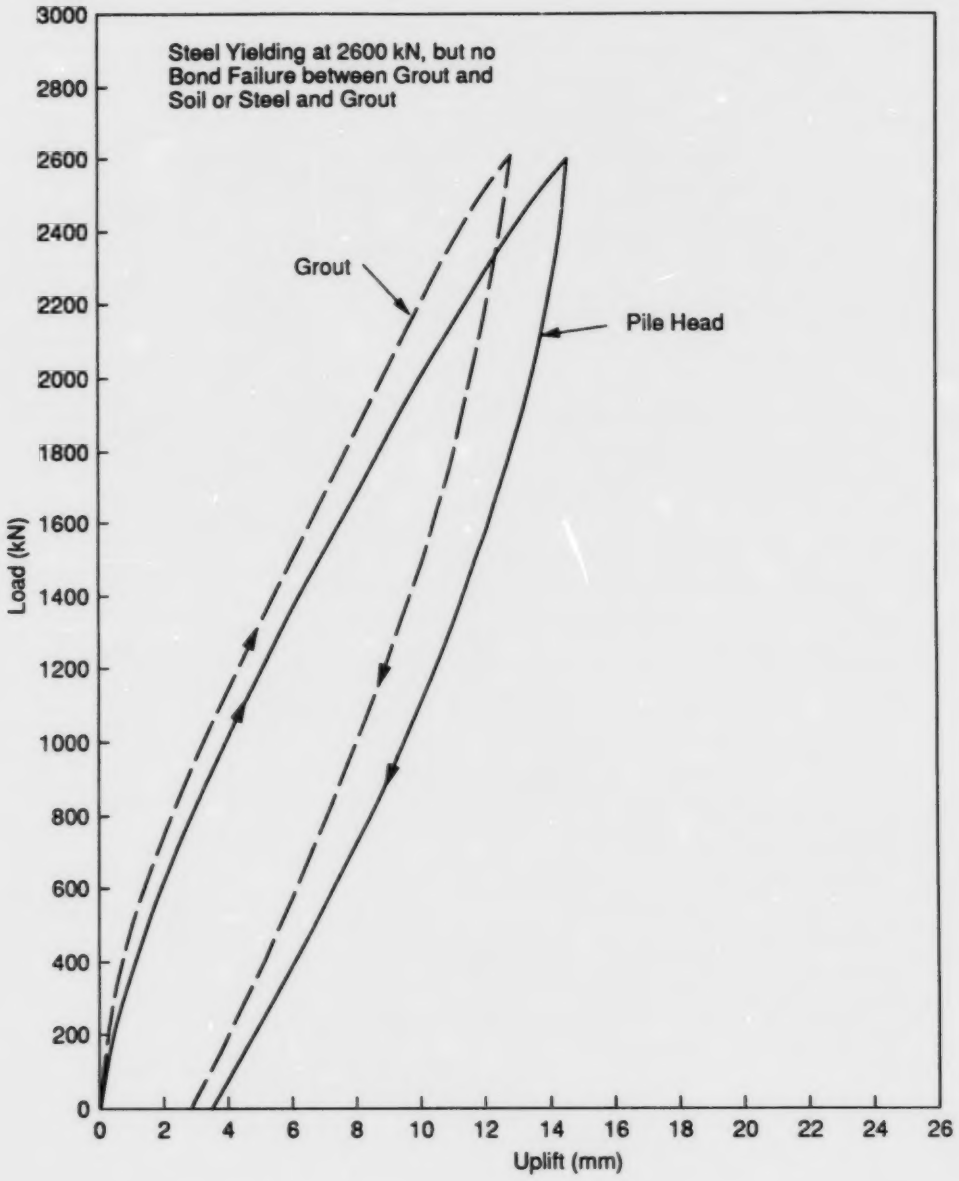


FIGURE 11

LOAD-DISPLACEMENT CURVE FOR GROUTED H-PILE

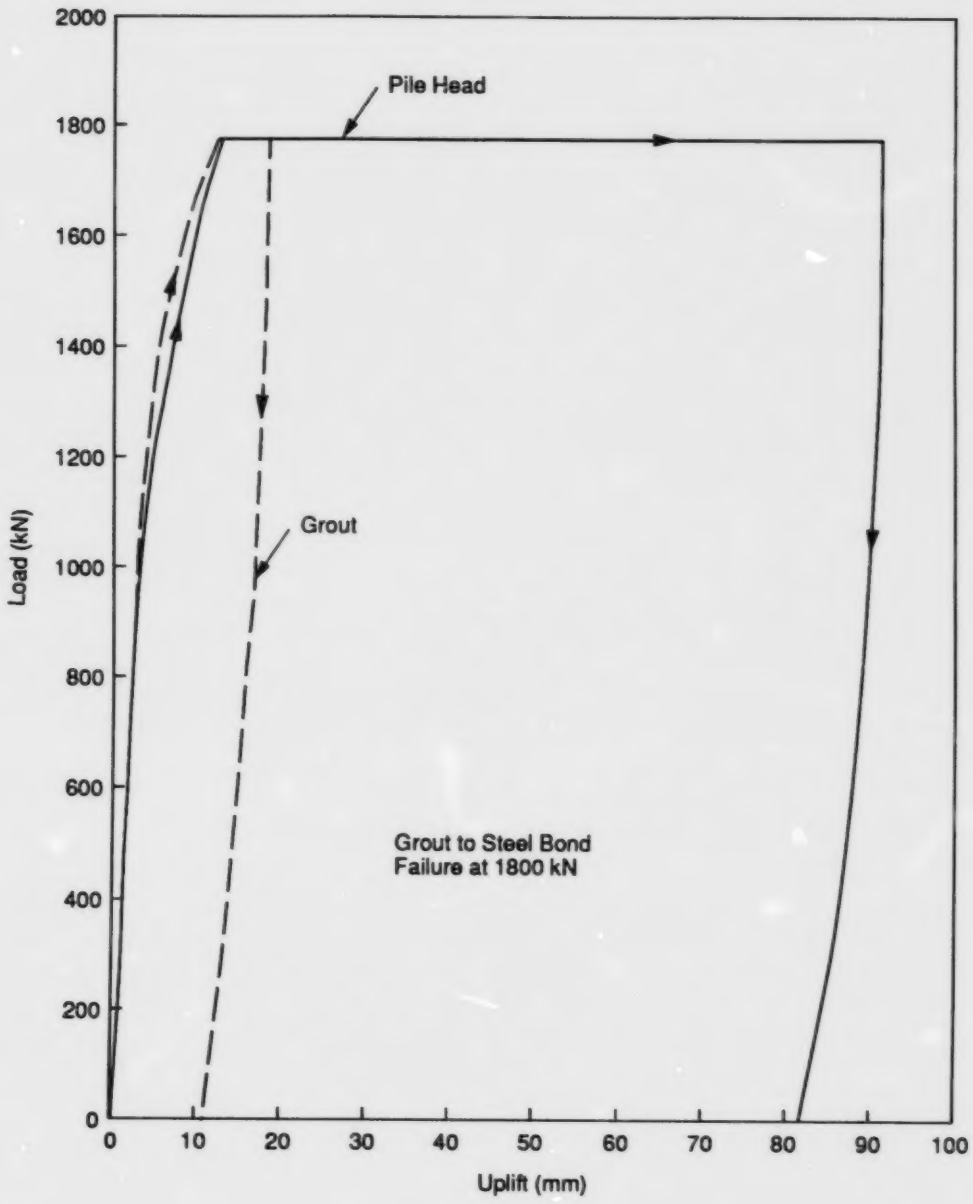


FIGURE 12

LOAD-DISPLACEMENT CURVE FOR GROUTED PIPE PILE

FIGURE 13

TELLTALE MOVEMENTS MEASURED DURING THE PILE LOAD TEST FOR THE CONVENTIONAL H-PILE

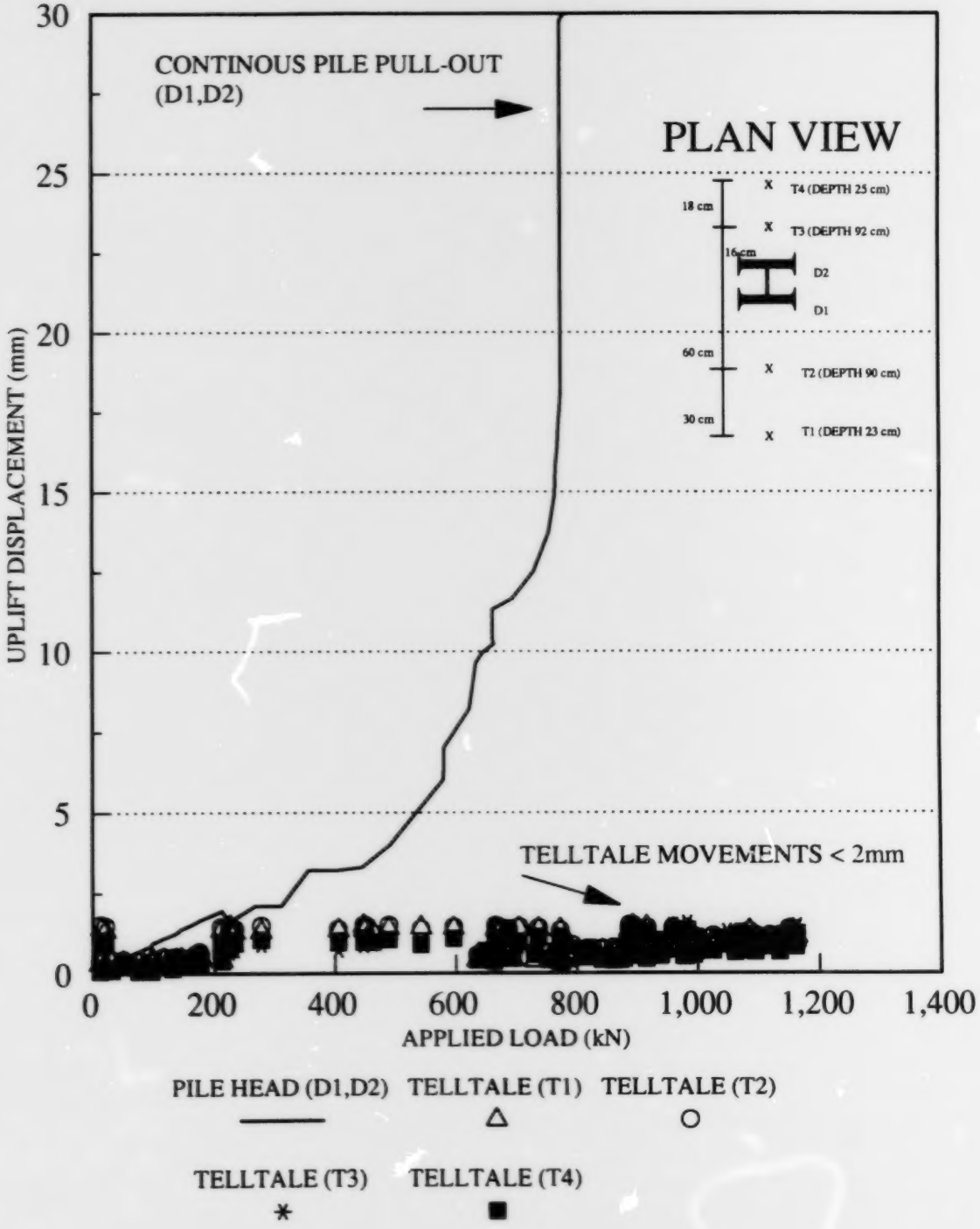


FIGURE 14

TELLTALE MOVEMENTS MEASURED DURING THE PILE LOAD TEST FOR THE GROUTED H-PILE

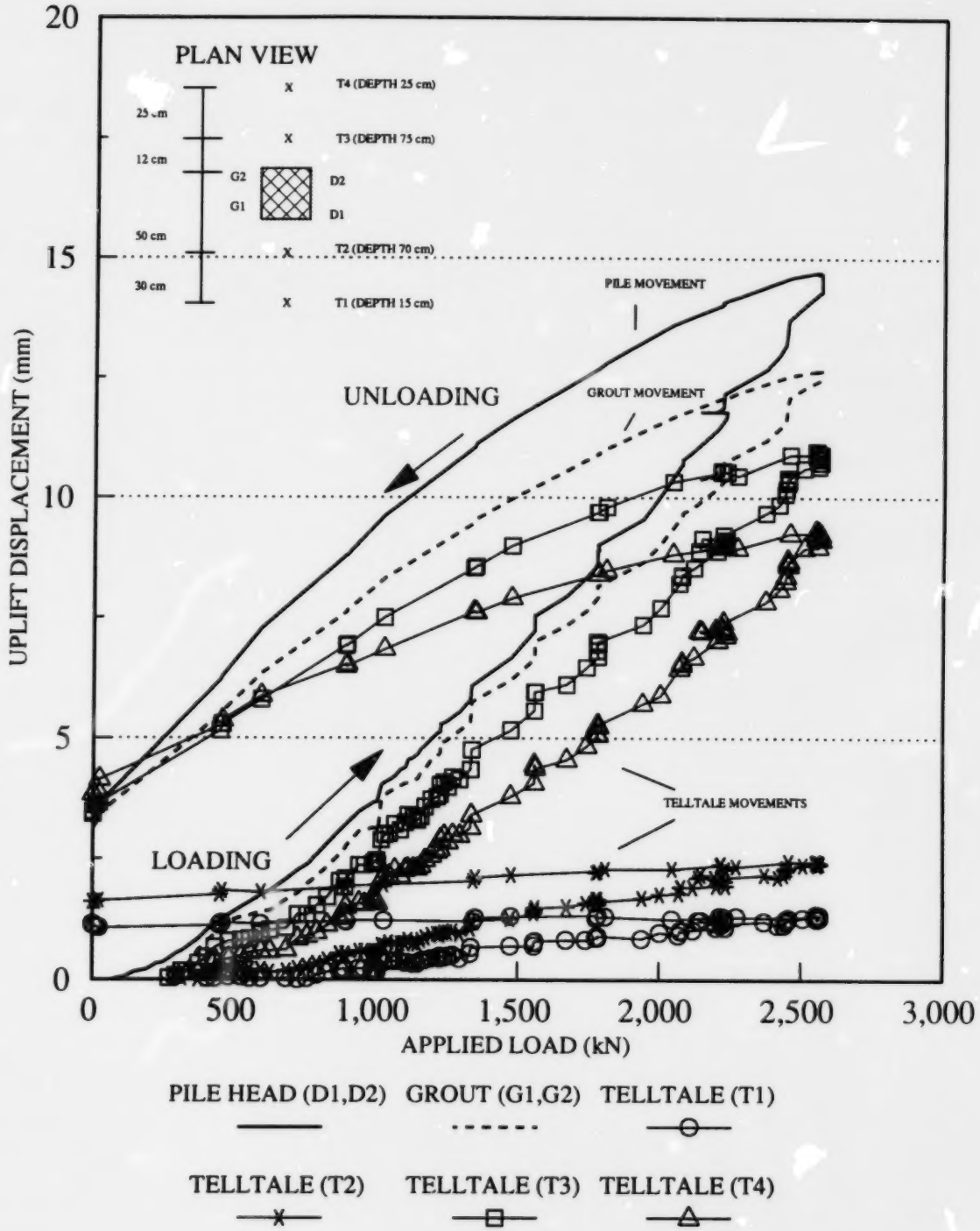
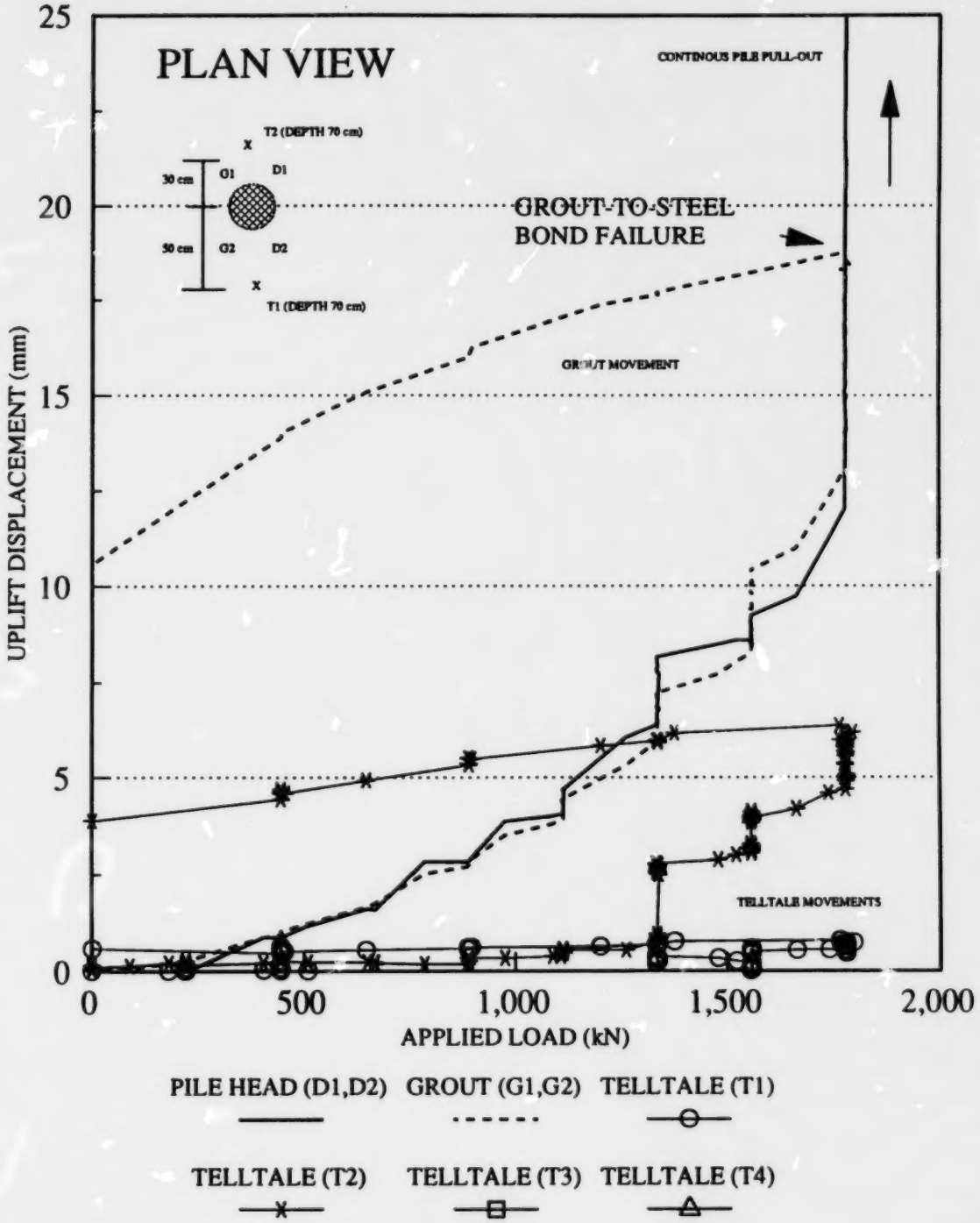


FIGURE 15

TELLTALE MOVEMENTS MEASURED DURING THE PILE LOAD TEST FOR THE GROUTED PIPE-PILE



APPENDIX I

Trial Grouting Mixtures

J.J. Deans
Concrete Officer
Concrete Technology Section
Civil Research

APPENDIX I

Research Division
800 Kipling Avenue, Toronto, Ontario, Canada M8Z 5S4

MEMORANDUM

Mr. R. Tsang
Engineer
Soil Sciences Section
Civil Research Dept, KR252

August 17, 1989

File: 842.44

Grouting Around Steel Piles
Transmission Line Construction

As per our discussion, a limited number of tests were carried out to examine a few grout mixes for use in grouting around the periphery of steel piles during the installation process. The particular grout to be used required a long working time of at least 4 hr, this being the time required to drive the steel pile into the ground. The purpose of this memo is to summarize the mix proportions and physical characteristics of the grouts tested.

Four grout mixes containing a combination of Type 10 cement and fly ash with and without the use of a retarder at a constant water to cement plus flyash ratio of 0.50, were evaluated (Table 1). The physical characteristics which were assessed included flow characteristics with time, density and compressive strength.

The results of the tests are summarized in Tables 1 and 2. Based on the results of the flow test and compressive strength development, Mix 14049 (Table 1) appears to provide the necessary physical characteristics, and therefore we would recommend the use of this mix.

Since this grout will be supplied as a prepackaged system, sufficient lead (ie 10 days) time will have to be allowed for the manufacturer (ie, King Paving) to produce this product.

J.J. Deans
Concrete Officer
Concrete Technology Section
Civil Research Department
(Ext 6685)

JJD:kd

Attach

cc M. S. Radhakrishna
M. Grills

90-201

Telephone (416) 231-4111 Telex No.: 06-984706 Facsimile (416) 231-9679

TABLE 1
EVALUATION OF GROUT MIXES FOR GROUTING
AROUND STEEL PILES
MIX PROPORTIONS AND PHYSICAL CHARACTERISTICS

Mix Identification	Mix Proportions		Retarder Euclid 100 (ml)	W/C + FA ratio	Physical Characteristics			
	Lab Standard Type 10 (g)	Lab Standard Fly Ash (FA) (g)			Hardened Density (Kg/m)	Compressive Strength (MPa) Age (days		
						3	7 /1/	28 /1/
14048	6400	1600	-	0.50	1880	18.8	25.1	
14049	6400	1600	25	0.50	1820	17.0	25.3	
14050	6400	1600	50	0.50	1829	7.9	19.4	
14051	4800	3200	25	0.50	1790	8.5	15.4	

/1/ To be reported later.

TABLE 2
EVALUATION OF GROUT MIXES FOR GROUTING
AROUND STEEL PILES
FLOW CHARACTERISTICS WITH TIME

Mix Identification	Flow (secs)/1/ Time (mins)/2/																		
	Initial	/2/ 15	30	45	60	75	90	105	120	135	150	165	180	195	250	280	310	340	370
14048	14.5/1/	14.6	15.8	15.4	15.2	15.6	16.6	17.5	17.0	16.8	18.7	-	19.2	-	18.6	20.0	20.0	60+	60+
14049	11.8	14.2	15.6	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	-	-	-	15.0	15.0	15.7	15.5	-
14050	10.6	13.8	14.8	16.4	17.0	16.5	18.6	18.0	18.4	-	18.6	-	-	-	17.8	19.0	20.2	19.2	19.1
14051	15.4	19.0	20.0	20.0	20.5	19.4	20.7	20.7	20.6	-	19.0	-	-	29.0	40.0	53.0	21.0	22.0	-

Note: Laboratory temperature: 23°C
Initial grout temperature: 24°C
Prior to carrying out the flow test at each time interval, the grout was remixed with a Jiffler mixer. Within 45 mins of mixing, all grout temperatures increased from 24° to 30°C. Grout temperatures subsequently decreased at approximately 300 min from 30°C to between 23° and 25°C.

(CV16)

Ontario Hydro

Research Division
800 Kipling Avenue, Toronto, Ontario, Canada M8Z 5S4

MEMORANDUM

MR. R. TSANG
Engineer
Soil Sciences Section
Civil Research Department

October 23, 1989

File: 842.44 (T1)

Grouting Around Steel Piles
Transmission Line Construction

A limited number of tests were carried out to examine the grout mix being supplied by King Paving for use in grouting around the periphery of steel piles. The particular grout to be used required a long working time of at least 4 hr, this being the time required to drive the steel pile into the ground. The purpose of this memo is to summarize the fresh and hardened characteristics of this grout.

Two grout mixes containing a combination of Type 10 cement, fly ash and a retarder were tested at a water to cement plus fly ash ratio of 0.40 and 0.45 (Table 1). The physical characteristics which were assessed included flow characteristics with time, density and compressive strength.

The results of the tests are summarized in Tables 1 and 2. Based on the results of the flow test and compressive strength development, both mixes (Table 1) appear to provide the necessary physical characteristics, although the grout mix at the lower water/cementing material ratio decreased in workability at a much faster rate.

It is recommended that during the actual field operation, samples of the grout be taken for testing of workability and compressive strength.

J. Deans

J.J. Deans
Concrete Officer
Concrete Technology Section
(Ext 6685)

JJD:ds

Attach

cc Dr. H.S. Radhakrishna
Mr. M. Grills
Mr. J. Forsyth
Mr. H. A. Dey

TABLE 1
EVALUATION OF KING PAVING GROUT MIX FOR GROUTING
AROUND STEEL PILES
MIX PROPORTIONS AND PHYSICAL CHARACTERISTICS

Mix Identification	Mix Proportions		Retarder Reset 5 (g)	w/C + FA ratio	Physical Characteristics			
	Type 10 Cement (g)	Fly Ash (FA) (g)			Hardened Density (kg/m)	Compressive Strength (MPa) Age (days) 2	7	28
14055	12000	3000	52.5	0.45	1876	17.0	26.7	35.5
14056	12000	3000	52.5	0.40	1931	21.1	31.1	42.6

(CV16)

TABLE 2
EVALUATION OF KING PAVING GROUT MIX FOR GROUTING
AROUND STEEL PILES
FLOW CHARACTERISTICS WITH TIME

Mix Identification	Time (Mins)	FLOW WITH TIME																		
		Initial	15	30	45	60	75	90	105	120	135	150	165	180	195	225	255	285	300	360	420
14055	Flow (Secs)	12.0/1/	11.6	-	14.0	-	15.7	-	16.0	-	15.6	-	15.0	-	15.0	14.8	15.6	14.8	15.4	15.5	16.2
14056		11.4	13.2	17.0	-	35.5	22	23.6	-	26.4	-	27.0	-	30.9	-	29.0	30.0	28.5	27.0	33.7	35.8

Note: Laboratory temperature: 23°C
Initial grout temperature: 24°C
Prior to carrying out the flow test at each time interval, the grout was remixed with a Jiffler mixer. Within 45 min of mixing, all grout temperatures increased from 24° to 28°C. Grout temperatures remained constant at 28°C for the remaining test period.

(CV16)

APPENDIX II

Static Load Testing

G.A. Senkiw
Associate Research Engineer
Mechanical Testing
Mechanical Research

MEMORANDUM

Mr. R. Tsang
Engineer
Soil Sciences Section
Civil Research Department, KR252

August 29, 1990

FILE NO:

Grouted Pile Load Tests - Cranberry Jct, Tillsonburg

Attached is Appendix II which describes the general test arrangement and test procedures used for testing grillages, footings, H-piles, and rock anchors. Figures 1 and 2 depict the actual test arrangement used for testing the grouted piles (above). A 2700 kN (300 ton) capacity hydraulic jack resting on top of a pair of 9 m (30 ft) long W36 steel beams was used to apply the uplift force to each pile. The bonding beams rested on top of the steel H-pile pads which were spaced approximately 6 m (20 ft apart). The loads were applied in steps of approximately 40 kN (10 kips).

G.A. Senkiw
Associate Research Engineer
Mechanical Research

Appendix II

Uplift Test Arrangement and Test Procedures for Single and Paired Earth Grillages, Soil and Rock Anchors, H-Piles, and Augered Footings

a) Test Arrangement

The schematics for performing the uplift tests on single and paired foundations are shown in Figures 1 and 2 respectively. H-pile reaction pads, consisting of welded HP14x89 sections approximately 1.8m x 2.0m, are often stacked one on top of another and at right angles such that the top pad is also 90 degrees to the length of the loading beams. Sometimes, instead of these H-pile, 8 - WWF20x175 beams, each 7m (24 ft) long - 4 at each end, are used to create a larger reaction area especially when soft soil conditions are encountered. For some soil anchor tests timber pads, 1.5m x 1.8m (5ft x 6ft), are used.

One of three sets of loading beams, (sizes, lengths and capacities are given in Figure 1), are used to support the hollow ram, hydraulic jacks. The selection of the loading beams is determined by the expected ultimate capacity of the anchorage and the required clear span. A clear span length of twice the anchorage installed depth (based on a 45 degree uplift cone), is a standard practice at Ontario Hydro. One or two of several sizes of hydraulic jacks, Figure 1 , are supported on steel bearing plates which rest on the loading beams. The steel bearing plates have one or two centre through holes for accommodating the steel pulling rods. Centre-hole compression load cells are used to monitor the applied load by each jack. The load cell capacity is matched to the capacity of the hydraulic jack. Three basic sizes and various lengths of threaded pulling rods are available for applying the uplift loads. Often Dywidag rebars with full tension couplers are used as pulling rods. Dywidag rebar has continuous threads and is supplied in various sizes and two steel strengths.

For performing angle pulls on single or a cluster of soil or rock anchors, special angle seats are bolted on top of the loading beams. When high angle loads are anticipated, the timber pads are buried for half their depth in soil and special beams and rods are used to prevent the beams from sliding horizontally on the timber pads. For high angle pull loads on rock anchors, a heavy bulldozer is stationed behind the loading beams.

Dial gauges or linear voltage displacement transformers (LVDT's) attached to steel or wood batter boards, placed below the loading beams, are used to record anchor or surrounding soil or rock uplifts. The batter boards rest on timbers which are placed well away from the zone of influence. The load cell and LVDT signals are fed to one or two X-Y recorders such that the load versus displacement plot can be obtained automatically. A computer controlled data acquisition system can also be used to simultaneously record many LVDT's with the applied load.

b) Test Procedures

The loads are applied in steps of approximately 10% of the expected failure load. The rate of loading is usually approximately 100 kN (25 kips) per minute with the 60 or 100 ton capacity hydraulic jacks and about twice that rate when the 300 or 1000 ton jacks are used. At each step all data is read and recorded. The load on each footing is maintained until the footing displacement has stopped or has appreciably subsided. The test is continued until the footing exhibits uplift failure or the applied load reaches the safe working load capacity of the loading beams or the pulling rods.

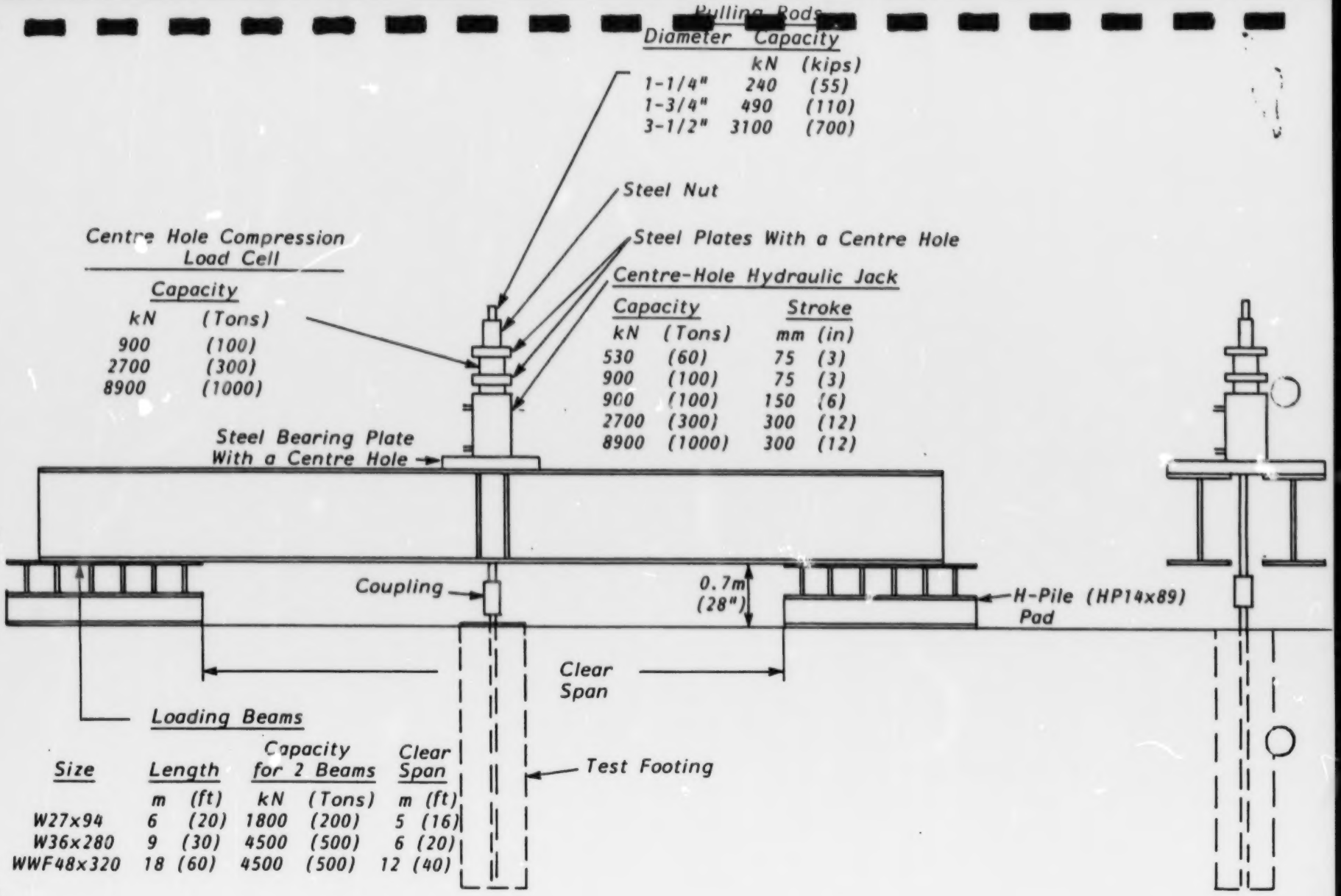


FIGURE 1

SINGLE FOOTING UPLIFT TEST ARRANGEMENT

90-201

177514-RD

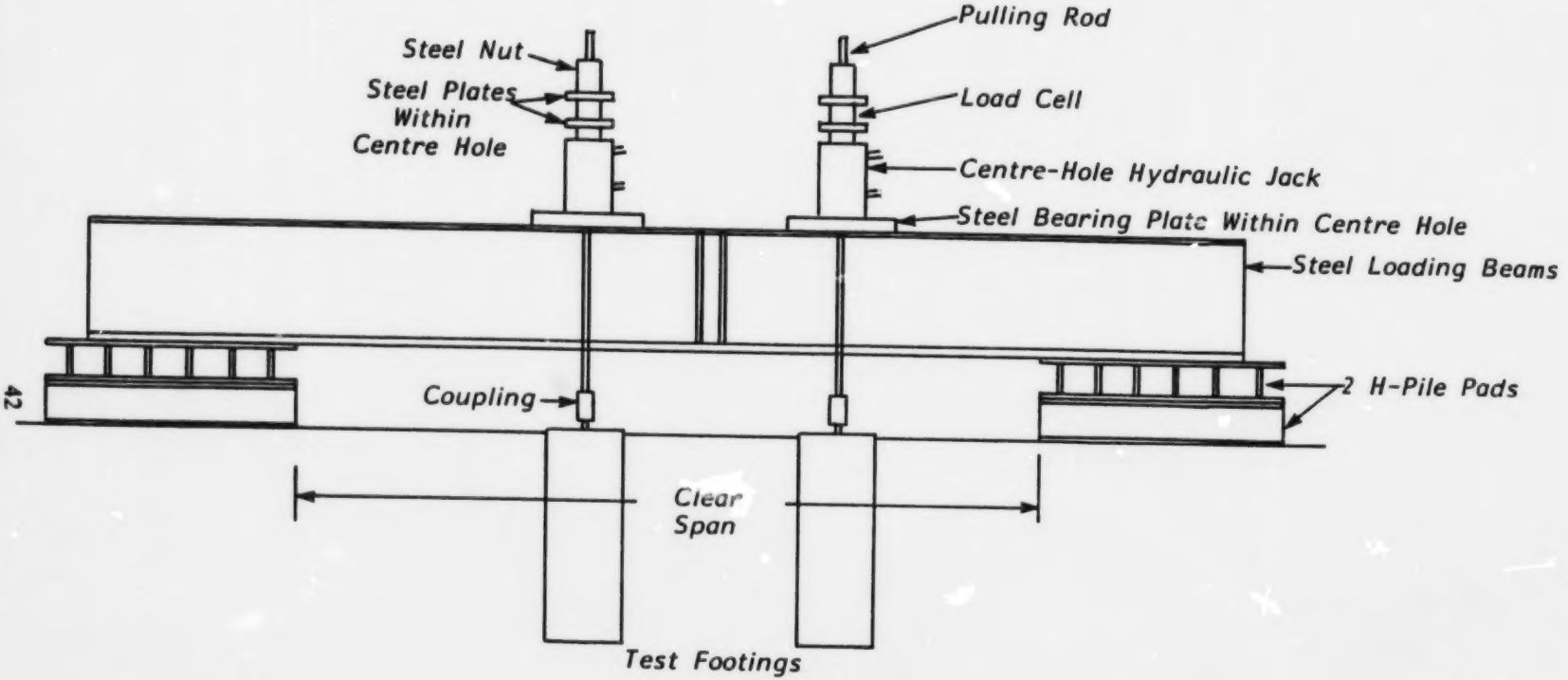


FIGURE 2

UPLIFT TEST ARRANGEMENT
FOR PAIRED FOOTINGS

LOAD TEST NO.1 - CONVENTIONAL H-PILE

GROUTED PILE LOAD TESTS - CRANBERRY JCT.

LOAD TEST #1

The time is 14:10:35.99

The date is 1-30-1990

TIME (SEC)	VLOAD (KN)	D1 (MM)	D2 (MM)	CREEP (MM/MIN)	T1 (MM)	T2 (MM)	T3 (MM)	T4 (MM)
0	0.0	-6.4582	-6.3500	0.0000	-13.9192	-28.9560	-49.1744	-39.8780
30	0.0	0.1778	0.2032	17.2720	0.3556	0.3810	0.2794	0.1016
60	0.0	0.1778	0.2032	0.0000	0.2540	0.2540	0.2794	0.0762
90	0.0	0.1778	0.2032	0.0000	0.2794	0.4318	0.4318	0.1270
120	11.7	0.2032	0.2794	0.0508	0.3048	0.3810	0.3556	0.0762
150	31.0	0.3556	0.4064	0.3048	0.3556	0.4318	0.3302	0.1016
180	50.2	0.4826	0.5334	0.2540	0.3556	0.4064	0.4572	0.2540
210	75.8	0.6858	0.7112	0.4064	0.3556	0.4318	0.3556	0.0762
240	96.7	0.8636	0.8636	0.3556	0.3810	0.3556	0.2032	0.0762
270	96.7	0.8890	0.9398	0.0508	0.4572	0.4826	0.3048	0.0000
300	96.1	0.8890	0.9398	0.0000	0.3556	0.4572	0.3302	0.1016
330	96.7	0.9144	0.9906	0.0508	0.3810	0.4572	0.3556	0.2286
360	96.7	0.9398	0.9906	0.0508	0.4064	0.4826	0.4318	0.2032
390	96.7	0.9398	1.0160	0.0000	0.4318	0.5842	0.5080	0.2540
420	98.3	0.9398	1.0160	0.0000	0.4318	0.3556	0.3810	0.1778
450	116.4	1.0922	1.1430	0.3048	0.4318	0.5080	0.4064	0.2286
480	131.4	1.1938	1.2446	0.2032	0.4064	0.4826	0.3048	0.1524
510	137.2	1.2446	1.2954	0.1016	0.4318	0.4826	0.4572	0.2540
540	137.8	1.2700	1.3462	0.0508	0.3810	0.4826	0.4318	0.3048
570	137.8	1.2954	1.3462	0.0508	0.5080	0.5588	0.4826	0.2286
600	137.2	1.3208	1.3462	0.0508	0.4064	0.4826	0.4572	0.3302
630	145.2	1.3716	1.4224	0.1016	0.4572	0.4826	0.2540	0.2540
660	161.3	1.4986	1.5748	0.2540	0.4572	0.4826	0.4826	0.3302
690	174.6	1.6256	1.7018	0.2540	0.4826	0.5842	0.5334	0.3048
720	176.2	1.6510	1.7272	0.0508	0.5334	0.5842	0.5588	0.3810
750	176.2	1.6510	1.7272	0.0000	0.4826	0.6096	0.5588	0.3556
780	176.2	1.6510	1.7272	0.0000	0.5588	0.6604	0.6096	0.2794
810	176.8	1.6510	1.7272	0.0000	0.5080	0.5842	0.4826	0.2286
840	212.5	1.9304	2.0066	0.5588	0.4064	0.5588	0.5588	0.3810
870	223.2	1.5000	1.5000					
900	223.7							
930	223.7							
960	224.3							
990	224.3							
1020	224.3							

TIME (sec) VLOAD(kN) D1(mm) D2(mm) CREEP(mm/min) T1(mm) T2(mm) T3(mm) T4(m

1050	223.7		
1080	224.3		
1110	224.3		
1140	224.8		
1170	224.3	1.6000	1.6000
1200	223.7		
1230	223.7		
1260	223.7		
1290	223.7		
1320	223.2		
1350	223.7		
1380	232.8		
1410	267.5	2.1000	2.1000
1440	269.7		
1470	269.1		
1500	269.1		
1530	269.1		
1560	269.1		
1590	268.6		
1620	268.6		
1650	269.1		
1680	269.1		
1710	269.1		
1740	269.1		
1770	269.1		
1800	269.1		
1830	268.6		
1860	267.5		
1890	267.5		
1920	268.1		
1950	267.5		
1980	267.0		
2010	267.0	2.1000	2.1000
2040	267.5		
2070	287.8		
2100	306.0		
2130	309.7		
2160	310.3		
2190	310.3		
2220	310.3		
2250	311.3	2.1000	2.1000

TIME (sec) VLOAD(kN) D1(mm) D2(mm) CREEP(mm/min) T1(mm) T2(mm) T3(mm) T4(m

LOAD TEST NO.1 - CONVENTIONAL H-PILE

2280	311.9		
2310	311.3		
2340	311.9		
2370	311.9		
2400	311.9		
2430	311.9		
2460	311.3		
2490	310.8		
2520	310.8		
2550	311.3		
2580	311.3		
2610	311.3		
2640	311.3		
2670	311.3		
2700	311.3		
2730	336.4		
2760	350.8		
2790	356.2	3.2000	3.2000
2820	357.2		
2850	357.8		
2880	359.4		
2910	359.4		
2940	359.4		
2970	359.4		
3000	359.9		
3030	360.5		
3060	360.5		
3090	359.9		
3120	360.5		
3150	360.5		
3180	360.5		
3210	360.5		
3240	366.9	3.2000	3.2000
3270	395.2		
3300	402.6	3.2000	3.2000
3330	403.7		
3360	403.7		
3390	403.2	3.2000	3.2000
3420	403.7		
3450	404.2		
3480	403.2		

TIME (sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	T1(mm)	T2(mm)	T3(mm)	T4(m

3510	403.2		
3540	403.2		
3570	402.1		
3600	406.4		
3630	437.3		
3660	443.8		
3690	444.3	3.3000	3.3000
3720	445.4		
3750	444.8		
3780	445.4		
3810	444.9		
3840	444.8		
3870	445.9		
3900	444.8		
3930	444.8		
3960	444.8		
3990	456.6		
4020	473.7		
4050	477.4		
4080	486.5		
4110	488.6		
4140	490.7	4.0000	4.0000
4170	491.8		
4200	493.4		
4230	492.9		
4260	492.3		
4290	492.3		
4320	492.9		
4350	494.5		
4380	494.0		
4410	493.4		
4440	494.5		
4470	493.4		
4500	494.5		
4530	495.0		
4560	494.5		
4590	494.5		
4620	494.5		
4650	494.5		
4680	494.5		
4710	494.5		

TIME (sec) VLOAD(kN) D1(mm) D2(mm) CREEP(mm/min) T1(mm) T2(mm) T3(mm) T4(m

4740	507.3		
4770	531.9		
4800	537.7		
4830	553.2		
4860	556.4		
4890	569.2		
4920	576.2		
4950	577.8		
4980	578.9		
5010	578.9	6.0000	6.0000
5040	579.4		
5070	578.9		
5100	578.3		
5130	578.9		
5160	578.3		
5190	578.9		
5220	580.5		
5250	579.9		
5280	579.9		
5310	579.9	6.5000	6.5000
5340	580.5		
5370	579.9		
5400	580.5		
5430	579.4		
5460	579.4		
5490	578.9		
5520	579.4		
5550	579.9	7.0000	7.0000
5580	587.4		
5610	599.1		
5640	601.8		
5670	610.9		
5700	622.6	8.2000	8.2000
5730	624.8		
5760	623.7		
5790	624.8		
5820	625.3		
5850	625.3		
5880	625.8		
5910	626.4		
5940	626.9		

TIME (sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	T1(mm)	T2(mm)	T3(mm)	T4(m

LOAD TEST NO.1 - CONVENTIONAL H-PILE

TIME (sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	T1(mm)	T2(mm)	T3(mm)	T4(m
5970	626.9							
6000	626.9							
6030	628.0							
6060	633.3							
6090	633.3	9.6500	9.6500					
6120	632.3							
6150	633.9							
6180	634.9	9.6774	9.7028	0.1016	0.4064	0.5588	0.5588	0.3810
6210	634.4	9.7028	9.7536	0.0508	0.3302	0.6350	0.6350	0.4572
6240	633.3	9.7282	9.8044	0.0508	0.4064	0.6604	0.6350	0.4572
6270	631.7	9.7536	9.8044	0.0508	0.5080	0.7620	0.7620	0.4826
6300	634.9	9.8044	9.8044	0.1016	0.4064	0.6858	0.7620	0.4826
6330	643.5	9.9314	9.9314	0.2540	0.4064	0.6604	0.7366	0.4826
6360	652.0	10.0838	10.1092	0.3048	0.4318	0.6858	0.6604	0.4318
6390	662.7	10.2362	10.2870	0.3048	0.4318	0.5842	0.5334	0.3556
6420	660.6	10.3632	10.3632	0.2540	0.4064	0.6604	0.6604	0.4572
6450	660.6	10.4902	10.4902	0.2540	0.4064	0.6604	0.7112	0.4572
6480	660.0	10.5410	10.5664	0.1016	0.5588	0.7366	0.7366	0.3810
6510	660.6	10.6426	10.6680	0.2032	0.4318	0.6604	0.6604	0.4572
6540	660.0	10.6426	10.6934	0.0000	0.3810	0.6096	0.7112	0.4572
6570	660.6	10.7442	10.7442	0.2032	0.5588	0.6858	0.7112	0.3302
6600	661.1	10.8204	10.8712	0.1524	0.3810	0.6350	0.7112	0.5080
6630	660.0	10.8712	10.8712	0.1016	0.4318	0.6604	0.6858	0.3556
6660	660.0	10.8712	10.8712	0.0000	0.4318	0.6604	0.6858	0.3556
6690	661.1	10.9474	10.9728	0.1524	0.4572	0.6604	0.5080	0.3810
6720	660.6	10.9982	11.0236	0.1016	0.3302	0.5588	0.5842	0.5334
6750	660.6	11.0744	11.0744	0.1524	0.4064	0.6604	0.5842	0.4572
6780	660.6	11.0998	11.0998	0.0508	0.5334	0.7366	0.6350	0.4572
6810	660.6	11.1252	11.0998	0.0508	0.4572	0.6604	0.6604	0.4572
6840	660.0	11.1760	11.1506	0.1016	0.4318	0.6604	0.7366	0.5334
6870	660.6	11.2014	11.2014	0.0508	0.5334	0.7366	0.6604	0.4572
6900	660.0	11.2776	11.2268	0.1524	0.5080	0.6604	0.6604	0.4572
6930	660.6	11.3030	11.3030	0.0508	0.4318	0.6604	0.7366	0.5334
6960	693.7	11.6586	11.6332	0.7112	0.4318	0.6604	0.6604	0.4572
6990	729.4	12.5222	12.5476	1.7272	0.3810	0.6350	0.7620	0.5842
7020	754.0	13.7160	13.7160	2.3876	0.4826	0.6350	0.4318	0.4064
7050	764.2	14.8844	14.8844	2.3368	0.5080	0.6858	0.6350	0.4572
7080	766.3	15.7480	15.8972	1.7272	0.4826	0.6350	0.6096	0.4572
7110	769.0	16.4338	16.3830	1.3716	0.3810	0.6350	0.7112	0.6096
7140	770.6	17.0434	16.9926	1.2192	0.5334	0.6604	0.4826	0.3302
7170	773.8	17.6022	17.5514	1.1176	0.3810	0.6350	0.5588	0.5080

LOAD TEST NO.1 - CONVENTIONAL H-PILE

7200	775.4	18.1102	18.1102	1.0160	0.5334	0.6858	0.3810	0.3302
7230	774.8	18.5674	18.5166	0.9144	0.4318	0.6350	0.5080	0.4826
7260	774.8	19.0500	18.9992	0.9652	0.3810	0.6096	0.4826	0.5334
7290	774.8	19.4310	19.4056	0.7620	0.5080	0.6858	0.5334	0.4572
7320	774.8	19.8120	19.8120	0.7620	0.4318	0.5842	0.4318	0.4572
7350	775.9	20.2184	20.1422	0.8128	0.4826	0.7112	0.5080	0.4572
7380	777.0	20.5740	20.5486	0.7112	0.4826	0.5588	0.4572	0.4572
7410	777.5	20.9550	20.9042	0.7620	0.4572	0.6350	0.6096	0.5080
7440	776.4	21.2852	21.2344	0.6604	0.3810	0.5334	0.5080	0.4572
7470	775.9	21.5392	21.5392	0.5080	0.5080	0.7112	0.4318	0.3048
7500	775.9	21.8186	21.7932	0.5588	0.3810	0.6350	0.6096	0.5842
7530	775.9	22.0218	22.0218	0.4064	0.4572	0.6604	0.5588	0.4572
7560	775.4	22.2758	22.1742	0.5080	0.5334	0.8128	0.5588	0.4572
7590	773.8	22.5044	22.4028	0.4572	0.5588	0.8128	0.5842	0.4826
7620	774.8	22.6568	22.6060	0.3048	0.4318	0.6604	0.4318	0.4572
7650	773.8	22.8346	22.7330	0.3556	0.5334	0.8128	0.5588	0.4826
7680	773.2	22.9870	22.8854	0.3048	0.3556	0.6350	0.5588	0.5588
7710	774.3	23.1648	23.0378	0.3556	0.5334	0.6604	0.5588	0.4572
7740	774.3	23.3680	23.2664	0.4064	0.4826	0.6858	0.5588	0.4572
7770	774.8	23.4950	23.3934	0.2540	0.4826	0.6604	0.5334	0.4572
7800	775.4	23.6728	23.5966	0.3556	0.4826	0.6604	0.5080	0.4572
7830	775.9	23.8252	23.7490	0.3048	0.5588	0.7874	0.6096	0.4572
7860	776.4	24.0030	23.9332	0.3556	0.4572	0.6604	0.5842	0.4826
7890	776.4	24.2062	24.1300	0.4064	0.4572	0.6858	0.5842	0.4572
7920	777.5	24.3840	24.3586	0.3556	0.5080	0.6858	0.5842	0.4572
7950	778.0	24.6634	24.6126	0.5588	0.3556	0.6096	0.5842	0.5842
7980	775.9	24.8666	24.7650	0.4064	0.4572	0.7366	0.7366	0.5588
8010	775.4	25.0698	24.9936	0.4064	0.4572	0.7874	0.6858	0.5080
8040	774.3	25.2476	25.1714	0.3556	0.5588	0.7874	0.6096	0.3810
8070	774.3	25.4254	25.3746	0.3556	0.3556	0.5588	0.5842	0.4572
8100	774.3	25.6540	25.5524	0.4572	0.4826	0.7620	0.5842	0.4826
8130	774.3	25.9080	25.7810	0.5080	0.4572	0.6604	0.5842	0.4572
8160	774.8	26.0858	25.9588	0.3556	0.3556	0.6096	0.5334	0.5588
8190	775.4	26.2636	26.1366	0.3556	0.5588	0.7620	0.6096	0.4572
8220	775.4	26.4160	26.3652	0.3048	0.5080	0.6858	0.5842	0.4572
8250	774.8	26.6446	26.5938	0.4572	0.5842	0.7112	0.5080	0.3810
8280	776.4	26.8224	26.7716	0.3556	0.5588	0.7112	0.6350	0.4572
8310	775.4	27.0002	26.8986	0.3556	0.4826	0.6858	0.5842	0.5334
8340	774.3	27.1272	27.0256	0.2540	0.6096	0.7620	0.6350	0.3810
8370	774.8	27.3050	27.2034	0.3556	0.6096	0.7112	0.4572	0.4318
8400	775.9	27.4574	27.3558	0.3048	0.4826	0.5842	0.5080	0.4572

TIME (sec) VLOAD(kN) D1(mm) D2(mm) CREEP(mm/min) T1(mm) T2(mm) T3(mm) T4(m

LOAD TEST NO.1 - CONVENTIONAL H-PILE

TIME (sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	T1(mm)	T2(mm)	T3(mm)	T4(m
8430	775.9	27.6352	27.5336	0.3556	0.5334	0.6858	0.4826	0.4826
8460	775.9	27.7114	27.6352	0.1524	0.5334	0.6096	0.5080	0.4826
8490	776.4	27.8892	27.7876	0.3556	0.5080	0.7874	0.6096	0.5080
8520	775.4	28.0162	27.9146	0.2540	0.5334	0.6858	0.4572	0.4826
8550	775.4	28.1178	28.0162	0.2032	0.5334	0.6858	0.5080	0.4826
8580	775.9	28.2448	28.1178	0.2540	0.5334	0.6858	0.6604	0.5842
8610	776.4	28.3718	28.2194	0.2540	0.5842	0.7112	0.5588	0.4826
8640	777.0	28.4734	28.3718	0.2032	0.4064	0.6096	0.5080	0.6096
8670	777.0	28.5496	28.4734	0.1524	0.5080	0.7620	0.6604	0.5842
8700	775.9	28.6520	28.5496	0.3048	0.5334	0.6858	0.3810	0.4572
8730	776.4	28.7528	28.6512	0.1016	0.5334	0.7112	0.5080	0.4318
8760	775.9	28.8798	28.7528	0.2540	0.5334	0.6350	0.3810	0.4318
8790	775.9	28.9306	28.8290	0.1016	0.4572	0.6858	0.5080	0.4826
8820	776.4	29.0576	28.9306	0.2540	0.5334	0.7366	0.4826	0.4572
8850	776.4	29.1084	29.0068	0.1016	0.5334	0.7874	0.6350	0.5080
8880	776.4	29.1846	29.0830	0.1524	0.5334	0.7112	0.4572	0.4572
8910	776.4	29.2862	29.1846	0.2032	0.5334	0.7112	0.5334	0.4572
8940	776.4	29.3624	29.2354	0.1524	0.5334	0.6858	0.5080	0.4572
8970	777.5	29.4894	29.3370	0.2540	0.5588	0.7874	0.6350	0.5080
9000	778.0	29.4894	29.3878	0.0000	0.5334	0.7874	0.6350	0.5334
9030	777.0	29.5402	29.4640	0.1016	0.5080	0.6858	0.5842	0.5080
9060	777.0	29.6672	29.5148	0.2540	0.5334	0.7112	0.4826	0.3556
9090	778.0	29.7180	29.6926	0.1016	0.4826	0.6858	0.5588	0.5588
9120	774.8	29.7434	29.6672	0.0508	0.5334	0.6858	0.5080	0.5080
9150	778.0	29.8704	29.6926	0.2540	0.6350	0.7366	0.5842	0.4826
9180	784.4	30.0228	29.8450	0.3048	0.6858	0.7620	0.6096	0.4318
9210	791.9	30.2260	30.0736	0.4064	0.6858	0.8636	0.6858	0.5334
9240	795.7	30.4800	30.3022	0.5080	0.6096	0.7366	0.6096	0.5080
9270	795.1	30.7086	30.5816	0.4572	0.4826	0.6350	0.6096	0.4826
9300	800.5	30.9372	30.8102	0.4572	0.5334	0.7366	0.6350	0.5842
9330	803.1	31.2166	31.0134	0.5588	0.5842	0.7366	0.6858	0.5080
9360	804.7	31.4706	31.2674	0.5080	0.6096	0.6350	0.5080	0.4318
9390	804.2	31.6484	31.5214	0.3556	0.5842	0.7366	0.6350	0.4318
9420	803.7	31.8262	31.6484	0.3556	0.6858	0.8128	0.6604	0.4318
9450	803.1	31.9786	31.8516	0.3048	0.6096	0.6604	0.5334	0.4826
9480	802.6	32.1310	31.8770	0.3048	0.5842	0.7366	0.6096	0.5334
9510	806.3	32.3342	32.1056	0.4064	0.5842	0.7620	0.7620	0.5842
9540	808.5	32.4866	32.2580	0.3048	0.6096	0.7366	0.6350	0.5080
9570	809.0	32.6136	32.4612	0.2540	0.5842	0.7366	0.6096	0.4826
9600	809.5	32.8422	32.5883	0.4572	0.6858	0.8636	0.6604	0.5080
9630	802.1	32.8930	32.6898	0.1016	0.6350	0.7620	0.6604	0.4064

LOAD TEST NO.1 - CONVENTIONAL H-PILE

TIME (sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	T1(mm)	T2(mm)	T3(mm)	T4(m
9660	799.9	32.9438	32.7152	0.1016	0.6858	0.8636	0.6604	0.5080
9690	799.9	32.9946	32.7660	0.1016	0.6350	0.7366	0.5588	0.4572
9720	799.4	33.0708	32.7914	0.1524	0.6858	0.7620	0.6096	0.4064
9750	799.4	33.1216	32.9438	0.1016	0.6096	0.7366	0.7112	0.5842
9780	799.4	33.2232	32.9438	0.2032	0.5334	0.7112	0.7620	0.6350
9810	799.9	33.2486	32.9692	0.0508	0.5842	0.7620	0.7366	0.5842
9840	802.1	33.3248	33.1470	0.1524	0.5842	0.6604	0.5588	0.4572
9870	803.7	33.4264	33.1724	0.2032	0.7112	0.8128	0.6858	0.4572
9900	805.3	33.4772	33.2232	0.1016	0.5588	0.6096	0.6350	0.4826
9930	816.5	33.6804	33.4264	0.4064	0.6096	0.7620	0.6604	0.5334
9960	824.5	33.9598	33.8074	0.5588	0.5842	0.7366	0.6096	0.4826
9990	824.5	34.2392	33.9852	0.5588	0.6096	0.8636	0.7620	0.5842
10020	825.0	34.4424	34.2392	0.4064	0.6096	0.7366	0.6096	0.5588
10050	825.6	34.6202	34.4170	0.3556	0.7112	0.7874	0.6350	0.4318
10080	826.1	34.7726	34.5694	0.3048	0.5842	0.7620	0.7620	0.5842
10110	825.6	34.8488	34.7218	0.1524	0.5588	0.7366	0.6096	0.5842
10140	825.6	35.1028	34.8488	0.5080	0.5842	0.6604	0.6096	0.4826
10170	826.1	35.2044	34.9504	0.2032	0.6604	0.6604	0.4572	0.4064
10200	825.6	35.2806	35.0520	0.1524	0.6604	0.7620	0.4572	0.4064
10230	826.6	35.4584	35.1536	0.3556	0.6350	0.7620	0.5080	0.3556
10260	827.2	35.5600	35.3314	0.2032	0.5842	0.7366	0.7112	0.6096
10290	826.6	35.6362	35.4330	0.1524	0.6858	0.8636	0.7112	0.5588
10320	827.2	35.7632	35.4838	0.2540	0.5334	0.7620	0.6604	0.5842
10350	827.2	35.7886	35.6108	0.0508	0.5842	0.7874	0.7366	0.6096
10380	826.6	35.9156	35.6870	0.2540	0.6096	0.7620	0.5842	0.4826
10410	827.2	35.9918	35.7378	0.1524	0.5080	0.7112	0.6096	0.5842
10440	827.7	36.0934	35.7886	0.2032	0.6096	0.7874	0.5842	0.5334
10470	827.2	36.1696	35.9664	0.1524	0.6350	0.7620	0.6604	0.5080
10500	827.2	36.2204	35.9410	0.1016	0.5588	0.7366	0.5842	0.5080
10530	826.6	36.3474	36.0934	0.2540	0.6604	0.7112	0.5334	0.4064
10560	826.1	36.3728	36.1442	0.0508	0.6350	0.7620	0.7112	0.6350
10590	841.6	36.5252	36.3982	0.3048	0.6858	0.7620	0.6350	0.4064
10620	860.3	37.0078	36.6014	0.9652	0.6604	0.7874	0.5588	0.3810
10650	872.6	37.7952	37.4650	1.5748	0.6858	0.7874	0.6604	0.4064
10680	883.8	38.6842	38.4302	1.7780	0.6604	0.7874	0.4064	0.6350
10710	888.6	39.6240	39.3684	1.8796	0.7620	0.8890	0.5080	0.5334
10740	891.2	40.4622	40.1066	1.6764	0.6604	0.7874	0.5080	0.5588
10770	894.5	41.1226	40.6654	1.3208	0.6858	0.7112	0.3810	0.4572
10800	896.6	41.5798	41.3004	0.9144	0.6858	0.7874	0.4064	0.4826
10830	897.1	41.9608	41.6306	0.7620	0.6604	0.8128	0.6350	0.6350
10860	897.7	42.3164	42.0624	0.7112	0.6858	0.8128	0.5588	0.4318

LOAD TEST NO.1 - CONVENTIONAL H-PILE

TIME (sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	T1(mm)	T2(mm)	T3(mm)	T4(m
10890	898.2	42.6212	42.3164	0.6096	0.6604	0.7620	0.5334	0.5080
10920	895.5	42.7990	42.4434	0.3556	0.6604	0.8636	0.7112	0.6350
10950	893.9	43.0022	42.6720	0.4064	0.7366	0.8382	0.5080	0.4826
10980	895.0	43.1546	42.8244	0.3048	0.6604	0.9144	0.6604	0.5588
11010	896.1	43.3070	43.0276	0.3048	0.6858	0.8128	0.4826	0.5588
11040	895.5	43.4594	43.1038	0.3048	0.6858	0.8128	0.6350	0.5588
11070	896.1	43.5864	43.3578	0.2540	0.5842	0.7366	0.5080	0.5334
11100	895.5	43.7388	43.5356	0.3048	0.6604	0.8128	0.4826	0.5842
11130	896.6	43.8404	43.5610	0.2032	0.6858	0.8128	0.4826	0.5588
11160	896.6	43.9420	43.6880	0.2032	0.6858	0.8636	0.6604	0.6350
11190	896.6	44.0436	43.9674	0.2032	0.6096	0.7366	0.5080	0.5334
11220	896.1	44.1452	43.7896	0.2032	0.5842	0.7366	0.5080	0.5334
11250	896.6	44.3230	43.9928	0.3556	0.7112	0.8128	0.5334	0.5588
11280	897.1	44.3738	44.1960	0.1016	0.6604	0.7874	0.6350	0.6096
11310	898.2	44.4500	44.2214	0.1524	0.6858	0.8890	0.7112	0.5588
11340	898.7	44.5770	44.3992	0.2540	0.7112	0.7366	0.3810	0.4318
11370	898.2	44.7040	44.4246	0.2540	0.7112	0.8382	0.5588	0.5588
11400	897.7	44.8056	44.5008	0.2032	0.6350	0.8128	0.6604	0.6604
11430	897.7	44.8564	44.5516	0.1016	0.6350	0.7112	0.5334	0.5080
11460	898.2	44.9580	44.6786	0.2032	0.6858	0.8128	0.5334	0.5334
11490	898.2	45.0342	44.8310	0.1524	0.7620	0.8890	0.5588	0.5080
11520	898.7	45.0596	44.7802	0.0508	0.6858	0.7366	0.5334	0.4826
11550	899.8	45.1866	44.8818	0.2540	0.6096	0.7620	0.6096	0.5334
11580	899.3	45.2882	44.8818	0.3032	0.6096	0.7366	0.6096	0.5334
11610	899.3	45.3136	45.1104	0.0508	0.6350	0.7366	0.5080	0.5080
11640	899.8	45.4152	45.1358	0.2032	0.7366	0.8636	0.6350	0.5334
11670	903.5	45.5168	45.1358	0.2032	0.6858	0.8890	0.6858	0.5588
11700	915.3	45.7200	45.4914	0.4064	0.7112	0.8636	0.6350	0.4318
11730	921.7	45.9486	45.6438	0.4572	0.7366	0.8636	0.6604	0.5842
11760	932.4	46.3550	45.9740	0.8128	0.7620	0.8890	0.6604	0.5334
11790	937.2	46.7106	46.4058	0.7112	0.6858	0.8382	0.7620	0.5334
11820	934.0	47.0662	46.5836	0.7112	0.6858	0.8890	0.7620	0.5588
11850	935.6	47.2186	46.7614	0.3048	0.8382	0.8890	0.7620	0.5588
11880	935.0	47.3710	46.9900	0.3048	0.7112	0.7620	0.6604	0.5334
11910	935.6	47.5234	47.0662	0.3048	0.8636	0.9906	0.8128	0.5588
11940	936.1	47.7774	47.2948	0.5080	0.7112	0.8128	0.7620	0.5842
11970	936.1	47.9044	47.5234	0.2540	0.7366	0.8890	0.7874	0.4572
12000	937.2	48.0568	47.7520	0.3048	0.6858	0.8636	0.8382	0.5588
12030	937.2	48.1584	47.9536	0.3032	0.7366	0.7366	0.7620	0.5334
12060	938.8	48.3870	47.9806	0.4572	0.8382	0.9398	0.7366	0.4318
12090	938.2	48.5394	48.1584	0.3048	0.7874	0.9144	0.8636	0.5588

LOAD TEST NO.1 - CONVENTIONAL H-PILE

TIME (sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	T1(mm)	T2(mm)	T3(mm)	T4(m
12120	939.3	48.6410	48.3108	0.2032	0.7874	0.9144	0.8382	0.6858
12150	939.3	48.7426	48.4378	0.2032	0.7874	0.9144	0.8636	0.7366
12180	939.8	48.7934	48.5902	0.1016	0.8128	0.9144	0.7366	0.5588
12210	939.8	48.9458	48.6156	0.3048	0.8382	0.9652	0.8128	0.5842
12240	939.3	49.0728	48.7680	0.2540	0.8382	0.9652	0.8128	0.4826
12270	938.8	49.0982	48.8950	0.0508	0.8382	0.9906	0.8890	0.6096
12300	938.8	49.2506	49.0220	0.3048	0.6858	0.8382	0.6858	0.6350
12330	939.3	49.3522	49.0474	0.2032	0.7112	0.8636	0.7112	0.5588
12360	938.2	49.4538	49.1236	0.2032	0.8382	0.9398	0.6858	0.6604
12390	936.1	49.5300	49.2506	0.1524	0.8128	0.9144	0.7620	0.6350
12420	937.7	49.6062	49.3014	0.1524	0.8890	0.9652	0.7620	0.5588
12450	938.2	49.6316	49.5300	0.0508	0.8128	0.9906	0.8636	0.5842
12480	937.7	49.7332	49.5554	0.2032	0.9636	0.9398	0.6350	0.5080
12510	937.2	49.7078	49.5300	-0.0508	0.8382	0.9906	0.7366	0.6096
12540	939.3	49.8856	49.5046	0.3556	0.8382	0.9652	0.7874	0.5588
12570	937.2	49.9618	49.6062	0.1524	0.8382	0.9398	0.7366	0.8096
12600	939.8	49.9618	49.7332	0.0000	0.7366	0.8128	0.6858	0.5588
12630	940.9	50.0634	49.8348	0.2032	0.8890	0.9652	0.7112	0.6096
12660	941.4	50.1650	49.9618	0.2032	0.8890	1.0668	0.8382	0.6350
12690	942.5	50.3174	50.0380	0.3048	0.8382	0.9906	0.6604	0.4572
12720	941.4	50.3174	50.0634	0.0000	0.7112	0.8890	0.7112	0.6604
12750	940.9	50.4190	50.2158	0.2032	0.8382	0.9906	0.7366	0.4826
12780	940.9	50.4952	50.3174	0.1524	0.8128	0.9144	0.6858	0.6350
12810	938.8	50.5206	50.2158	0.0508	0.8382	0.9906	0.7366	0.5588
12840	946.8	50.5968	50.3428	0.1524	0.8382	0.9398	0.7874	0.7112
12870	976.2	51.0540	50.8016	0.9144	0.9144	0.9906	0.7366	0.5334
12900	980.4	51.5366	51.1810	0.9652	0.9636	0.9906	0.7620	0.5080
12930	983.6	52.0192	51.7652	0.9652	0.7874	0.8890	0.8096	0.6096
12960	984.7	52.4256	51.9938	0.8128	0.9144	1.0668	0.8382	0.6096
12990	987.4	52.6542	52.4256	0.4572	0.8890	0.9398	0.6604	0.5842
13020	986.8	52.9844	52.8254	0.6604	0.9398	1.1430	0.8382	0.6604
13050	986.3	53.1622	52.9336	0.3556	0.8636	1.0160	0.8128	0.6858
13080	985.2	53.4162	53.1114	0.5080	0.9398	1.0922	0.7874	0.6350
13110	984.7	53.5940	53.3454	0.3556	0.8382	0.9144	0.7366	0.6350
13140	984.7	53.7210	53.3908	0.2540	0.8890	0.9906	0.7366	0.7366
13170	989.0	53.9496	53.5940	0.4572	0.8382	0.9906	0.8636	0.7366
13200	991.1	54.2036	53.8734	0.5080	0.8382	0.9906	0.8128	0.7112
13230	993.2	54.3306	54.0258	0.2540	0.8382	1.0160	0.8636	0.6858
13260	994.8	54.5592	54.2798	0.4572	0.9398	1.0668	0.7874	0.6604
13290	994.8	54.7624	54.3560	0.4064	0.8636	1.1176	0.9144	0.7620
13320	992.7	54.8640	54.5846	0.2032	0.8890	1.0160	0.7366	0.5588

LOAD TEST NO.1 - CONVENTIONAL H-PILE

TIME (sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	T1(mm)	T2(mm)	T3(mm)	T4(m
13350	992.2	55.0936	54.7370	0.4572	0.9144	0.9144	0.5334	0.5588
13380	993.2	55.1688	54.9656	0.1524	0.7874	0.8890	0.6350	0.6350
13410	991.6	55.3720	54.9148	0.4064	0.8890	0.9906	0.6350	0.6858
13440	990.6	55.4990	55.0936	0.2540	0.8636	0.9906	0.7366	0.7112
13470	989.5	55.6006	55.2196	0.2032	0.9906	1.0668	0.6350	0.6604
13500	989.5	55.4736	55.2704	-0.2540	0.8890	1.0160	0.6604	0.5588
13530	990.0	55.7022	55.3974	0.4572	0.9906	1.1176	0.8128	0.6858
13560	990.0	55.8292	55.6260	0.2540	0.8636	1.0414	0.9906	0.7620
13590	988.4	55.8546	55.6260	0.0508	0.8890	1.0668	0.8890	0.6858
13620	989.0	56.0070	55.7022	0.3048	0.8128	0.9652	0.8890	0.6604
13650	992.2	56.0578	55.7530	0.1016	0.8382	1.0414	0.9398	0.7366
13680	993.2	56.1340	55.9562	0.1524	0.9398	1.0160	0.8128	0.5842
13710	992.2	56.2610	56.0324	0.2540	1.0160	1.1684	0.9906	0.7112
13740	992.7	56.3626	55.9562	0.2032	0.9144	1.0668	0.9398	0.6096
13770	991.1	56.4388	56.2356	0.1524	0.9652	1.0668	0.9906	0.6858
13800	990.6	56.5404	56.2610	0.2032	0.9398	1.0668	0.9144	0.6096
13830	989.5	56.6166	56.2864	0.1524	0.9906	1.1684	1.1176	0.7112
13860	991.1	56.6420	56.0832	0.0508	0.9398	1.0668	1.0160	0.6858
13890	990.6	56.8706	56.5458	0.4572	0.8382	0.9652	0.9906	0.6858
13920	991.1	56.9468	56.5658	0.1524	0.9398	1.0668	1.0668	0.6858
13950	991.1	56.8960	56.6674	-0.1016	0.8890	1.0414	1.0414	0.7112
13980	990.6	56.9976	56.6674	0.2032	0.9906	1.0922	1.0414	0.6604
14010	989.0	57.0992	56.7182	0.2032	0.8636	1.0668	1.0668	0.7112
14040	987.9	57.1500	56.8452	0.1016	0.9652	1.0668	0.9906	0.6604
14070	987.9	57.1500	56.8452	0.0000	0.8382	0.9652	1.0668	0.7112
14100	988.4	57.1500	56.9214	0.0000	0.9398	1.0922	1.0414	0.7112
14130	988.4	57.2770	57.0484	0.2540	0.9144	1.0414	1.1176	0.7366
14160	988.4	57.2770	57.0230	0.0000	0.8890	0.9906	1.0160	0.6858
14190	988.4	57.3532	57.1246	0.1524	0.9652	1.0668	0.9906	0.6604
14220	1000.7	57.3818	57.3024	0.4572	0.8890	1.0922	1.1176	0.6858
14250	1024.7	57.9628	57.6834	0.7620	0.9906	1.1430	1.1430	0.6858
14280	1047.2	58.6232	58.3438	1.3208	0.9652	1.0922	1.2700	0.8636
14310	1062.1	59.7154	59.2826	2.1844	0.9652	1.1176	1.1938	0.6858
14340	1067.5	60.6806	60.2996	1.9304	0.9906	1.2192	1.2700	0.7620
14370	1065.9	61.3696	61.1378	1.7780	0.8636	1.0414	1.1430	0.7112
14400	1066.9	62.0014	61.6712	0.8636	0.9398	1.0922	1.1684	0.7620
14430	1068.0	62.5856	62.2046	1.1684	0.9652	1.1430	1.1938	0.6858
14460	1069.1	63.1190	62.6364	1.0668	0.9906	1.1430	1.1430	0.7366
14490	1068.5	63.2714	63.0936	0.3048	0.9906	1.1176	1.1176	0.6858
14520	1069.6	63.6524	63.4238	0.7620	0.9652	1.1430	1.2192	0.7366
14550	1069.6	64.0588	63.7794	0.8128	0.9652	1.1938	1.2192	0.7874

LOAD TEST NO.1 - CONVENTIONAL H-PILE

TIME (sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	T1(mm)	T2(mm)	T3(mm)	T4(m
14580	1067.5	64.3434	64.1330	0.0096	1.0160	1.1684	1.2192	0.6350
14610	1066.9	64.5160	64.2874	0.3048	0.9652	1.1938	1.3462	0.8636
14640	1067.5	64.7700	64.4906	0.3080	0.9652	1.1176	1.2192	0.7366
14670	1066.4	65.1510	64.8462	0.7620	0.9652	1.1176	1.2192	0.7874
14700	1064.8	65.1764	64.9478	0.0508	0.8636	1.1176	1.1938	0.7620
14730	1064.8	65.4304	65.1256	0.5080	0.9144	1.0922	1.2192	0.8382
14760	1064.8	65.6336	65.2526	0.4064	0.9906	1.1684	1.2192	0.7874
14790	1065.3	65.8368	65.4558	0.4064	0.9906	1.1430	1.0922	0.6350
14820	1062.7	65.9130	65.5374	0.1524	0.9906	1.1176	1.1430	0.7874
14850	1062.7	66.1670	65.8114	0.5080	0.9144	1.1176	1.1176	0.8128
14880	1060.5	66.1924	65.8368	0.0508	0.9906	1.1176	1.0160	0.7620
14910	1063.7	66.2686	65.9384	0.1524	1.1176	1.2192	1.1430	0.7874
14940	1066.4	66.4718	66.1416	0.4064	1.0922	1.2192	1.1430	0.8382
14970	1066.4	66.5988	66.4210	0.2540	0.9906	1.1176	1.1176	0.6604
15000	1064.8	66.7512	66.3194	0.3048	0.9906	1.1430	1.0414	0.6350
15030	1064.3	66.8782	66.3956	0.2540	0.9906	1.1176	1.1684	0.8382
15060	1063.2	66.8782	66.5734	0.0000	0.9906	1.1176	1.1176	0.7620
15090	1062.7	67.1068	66.7512	0.4572	0.9906	1.1176	1.0922	0.7620
15120	1062.1	67.1322	66.9036	0.0508	0.9398	1.0160	1.0922	0.7112
15150	1061.6	67.4116	66.9798	0.5588	0.9906	1.1430	0.9906	0.6096
15180	1061.1	67.4116	66.9036	0.0000	1.0160	1.1176	1.0922	0.8636
15210	1061.1	67.4624	67.1068	0.1016	0.9906	1.1684	1.0160	0.6350
15240	1060.0	67.6148	67.2592	0.3048	1.0922	1.1430	1.1430	0.7620
15270	1060.7	68.0466	67.6148	0.8636	0.9144	1.0922	1.1430	0.7620
15300	1060.8	68.2498	68.0974	0.4064	1.0414	1.1430	1.1684	0.7620
15330	1060.3	68.6562	68.2752	0.8128	0.9398	1.1176	1.1684	0.8382
15360	1059.4	68.8848	68.5292	0.4572	0.9906	1.1430	1.1684	0.7874
15390	1059.9	69.2404	68.8594	0.7112	0.9906	1.1176	1.2700	0.9652
15420	1059.9	69.3420	68.8594	0.2032	1.0668	1.1684	1.1684	0.8128
15450	1060.4	69.5706	68.8594	0.4572	1.0668	1.1684	1.1938	0.7366
15480	1059.4	69.7738	69.6468	0.4064	1.0160	1.1430	1.1684	0.8890
15510	1059.4	70.0278	69.6722	0.5080	0.9906	1.1430	1.2954	0.9398
15540	1058.4	70.2818	69.8754	0.5080	1.0668	1.1684	1.0414	0.7366
15570	1058.3	70.4850	70.2056	0.4064	1.0160	1.1684	1.2700	0.7874
15600	1057.2	70.7644	70.2818	0.5588	1.0414	1.1684	1.2192	0.8128
15630	1058.8	70.7644	70.5358	0.0000	1.1938	1.2192	1.1938	0.8128
15660	1065.1	71.0438	70.7136	0.5588	1.0414	1.1684	1.1938	0.8128
15690	1094.2	71.2470	70.9168	0.4064	1.0668	1.1684	1.0414	0.6604
15720	1117.7	71.7042	71.3232	0.9144	1.0414	1.1684	1.1176	0.8128
15750	1134.2	72.6694	72.2630	1.9304	1.0668	1.1684	1.0160	0.6604
15780	1154.0	73.8886	73.6346	2.4384	0.9652	1.0668	1.0922	0.8128

LOAD TEST NO.1 - CONVENTIONAL H-PILE

TIME (sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	T1(mm)	T2(mm)	T3(mm)	T4(m
15810	1158.8	75.6928	75.2348	3.6068	0.9652	1.1176	1.1430	0.8128
15840	1159.8	77.1144	76.5810	2.8448	0.9906	1.0414	1.1684	0.8128
15870	1158.8	78.2828	77.9272	2.3368	1.0922	1.2446	1.1938	0.8890
15900	1158.8	79.4004	79.1210	2.2352	1.0160	1.0922	1.0922	0.8128
15930	1159.8	80.1878	80.3402	1.5748	1.1430	1.2192	1.2192	0.8128
15960	1160.4	81.8642	81.5340	3.3528	1.0922	1.1938	1.2446	0.8382
15990	1160.4	83.0072	82.4484	2.2860	1.0668	1.1938	1.1938	0.8636
16020	1161.5	84.1756	83.4898	2.3368	1.1176	1.1938	1.2446	0.8890
16050	1162.0	84.9884	84.5820	1.6256	1.1176	1.1938	1.3208	1.0668
16080	1163.6	86.4108	85.8266	2.8448	1.0922	1.1684	1.3208	1.0414
16170	1164.7	88.8238	88.3920	1.6764	1.1430	1.2192	1.2446	0.8128
16200	1164.7	89.9668	89.2810	2.2860	1.1176	1.1938	1.2954	0.9144
16260	1165.7	91.2876	90.8558	153.8224	1.0922	1.1938	1.2446	0.9144
16290	1166.3	92.2020	91.6686	1.8288	1.1430	1.2192	1.2700	0.9398
16320	1164.7	92.9132	92.7608	1.4224	1.0160	1.1684	1.2446	1.0160
16350	1163.6	93.9546	93.4720	2.0828	1.0922	1.1938	1.3208	1.0160
16380	1163.1	94.6404	94.1832	1.3716	1.1430	1.2446	1.3208	0.9652
16410	1163.6	95.5040	95.2754	1.7272	1.1430	1.2446	1.3462	0.9906
16440	1163.1	95.8850	95.8342	0.7620	1.1430	1.2446	1.3462	0.8890
16470	1163.6	97.0788	96.3422	2.3876	1.0922	1.1176	1.2700	0.9398
16500	1162.0	97.8916	97.1296	1.6256	1.2446	1.3208	1.3970	0.9906
16530	1162.0	98.5012	98.5266	1.2192	1.0414	1.1176	1.2192	0.9398
16560	1161.5	99.2886	99.3140	1.5748	1.1684	1.2446	1.2700	0.8382
16590	1161.5	100.0760	99.8728	1.5748	1.1430	1.2446	1.3970	1.0922
16620	1161.5	100.9904	100.8380	1.8288	1.1430	1.2192	1.3208	0.9652
16650	1160.9	102.0572	101.4984	2.1336	1.1430	1.2446	1.3208	0.9652
16680	1162.0	102.4636	102.5906	0.8128	1.0414	1.1684	1.2954	0.9906
16710	1162.5	104.1654	103.7590	3.4036	1.1430	1.1684	1.3208	0.9652
16740	1162.0	104.9274	104.4194	1.5240	1.1938	1.2700	1.4224	1.0160
16770	1162.0	105.8164	105.3846	1.7780	1.1430	1.1684	1.2446	0.9652
16800	1159.8	106.8324	106.3752	2.0320	1.1684	1.2446	1.4478	1.1176
16830	1160.9	107.7468	106.9086	1.8288	1.1684	1.3208	1.4986	1.1176
16860	1162.0	108.5850	108.3564	1.6764	1.1176	1.2192	1.4478	1.1684
16890	1160.4	109.8042	109.4994	2.4384	1.1176	1.1684	1.3716	1.1430
16920	1157.2	111.3028	110.5408	2.9972	1.2192	1.2700	1.3970	1.0160
16950	1153.4	112.2680	111.8362	1.9304	1.1938	1.2192	1.2954	1.0160
16980	1151.8	114.0206	113.2078	3.5052	1.2192	1.2700	1.3970	1.0414
17010	1149.7	115.2906	115.0366	2.5400	1.2954	1.3716	1.3970	1.0668
17100	1084.0	118.1862	117.6782	0.3048	1.2954	1.2954	1.2700	1.1684
17130	982.0	117.7798	117.4242	-0.8128	1.2954	1.3716	1.5240	1.3208
17160	958.5	117.5512	117.0960	-0.4572	1.3462	1.3970	1.4732	1.1684

LOAD TEST NO.1 - CONVENTIONAL H-PILE

17190	914.7	117.4750	116.6114	-0.1524	1.4224	1.3970	1.3970	1.0668
17220	915.8	117.5004	116.6622	0.0508	1.3462	1.3970	1.3970	1.0414
17250	900.3	117.0432	116.4590	-0.9144	1.3208	1.3716	1.3970	1.1684
17280	891.8	117.1448	116.3320	0.2032	1.4478	1.4986	1.3716	1.1430
17310	885.4	117.2972	116.5098	0.3048	1.3208	1.3970	1.3716	1.1430
17340	887.0	117.3226	116.5606	0.0508	1.3462	1.3970	1.3970	1.1176
17370	887.0	117.2972	116.5606	-0.0508	1.2954	1.4986	1.4986	1.2192
17400	887.5	117.3226	116.5860	0.0508	1.3208	1.3970	1.2954	1.0668
17460	772.2	115.7478	115.5446	2.3876	1.3462	1.3208	1.2192	1.1176
17490	736.4	115.7478	115.0366	0.0000	1.3716	1.3970	1.1684	1.1176
17520	703.8	115.2398	115.0112	1.0160	1.3970	1.4224	0.8382	0.9652
17550	686.2	115.4938	115.0366	0.5080	1.2700	1.3716	0.9652	1.1938
17580	673.9	115.4684	114.9604	0.0508	1.3462	1.3970	0.9652	1.0414
17610	665.9	115.4430	114.6810	0.0508	1.3462	1.3716	0.9652	1.0668
17640	665.9	115.3922	114.7064	0.1016	1.3462	1.4224	0.8890	1.0414
17670	664.8	115.2906	114.6810	0.2032	1.3716	1.4732	0.9652	1.0668
17700	595.9	114.4524	113.9190	1.6764	1.3970	1.4224	1.0414	1.0668
17730	542.0	114.2746	113.0046	0.3556	1.4224	1.3716	0.9398	0.8890
17760	488.6	113.7158	113.0554	1.1176	1.3970	1.4986	1.0668	1.0414
17790	461.9	113.3856	112.8014	0.6604	1.2954	1.3446	0.9144	0.9652
17820	447.5	113.1824	112.7760	0.4064	1.3716	1.3970	0.8636	0.9652
17850	448.6	113.1570	112.7506	0.0508	1.3462	1.4986	1.0668	1.0922
17880	447.0	113.1316	112.6490	0.0508	1.4732	1.4986	0.9652	0.9652
17910	405.3	112.6998	112.2426	0.8636	1.3462	1.3716	0.7112	1.0160
17940	277.7	111.4044	110.6678	2.5908	1.2954	1.4732	0.8890	1.0414
17970	233.4	110.9726	110.4900	0.8636	1.2700	1.3716	0.7112	0.9398
18000	228.6	110.8710	110.1598	0.2032	1.2192	1.3208	0.7366	0.9652
18030	226.4	110.9218	110.0328	0.1016	1.4478	1.4224	0.7620	0.8636
18060	225.9	110.8710	110.2614	-0.1016	1.2954	1.3716	0.7874	0.9144
18090	225.3	110.9218	110.1852	0.1016	1.3462	1.4224	0.7112	0.8382
18120	225.3	110.9472	110.2614	0.0508	1.4224	1.4478	0.6604	0.7874
18150	211.5	110.5662	109.9312	0.7620	1.3462	1.4224	0.7366	0.9398
18180	20.8	107.9580	107.7722	5.2324	1.3462	1.4732	0.8636	0.9144
18210	13.4	107.8738	107.6706	0.1524	1.4224	1.5240	0.7620	0.8890

TIME (sec) VLOAD(kN) D1(mm) D2(mm) CREEP(mm/min) T1(mm) T2(mm) T3(mm) T4(m

LOAD TEST NO. 2 - GROUTED H-PILE

GROUTED PILE LOAD TEST - CRANBERRY JCT

LOAD TEST #2

The time is 13:07:37.87

The date is 1-31-1990

TIME (SEC)	VLOAD (KN)	D1 (MM)	D2 (MM)	CREEP (MM/MIN)	G1 (MM)	G2 (MM)	T1 (MM)	T2 (MM)	T3 (MM)	T4 (MM)
0	0.0	-3.7846	2.5876	0.0000	1.9812	12.4714	-2.9210	6.7818	19.5072	14.3510
30	0.0	-0.0254	0.0000	7.5184	-0.2286	0.0000	-0.1016	-0.0762	-0.2032	-0.1524
60	0.0	-0.0254	0.0000	0.0000	-0.3302	0.0508	-0.0254	0.0254	-0.2286	-0.2540
90	0.5	-0.0254	0.0000	0.0000	-0.4064	0.0254	-0.1270	-0.0762	-0.3302	-0.3556
120	0.5	-0.0508	0.0254	0.0508	-0.4572	-0.0508	0.1016	0.0508	-0.4064	-0.3810
150	1.1	-0.0508	0.0000	0.0000	-0.5334	0.0508	-0.0762	-0.0254	-0.4572	-0.4318
180	22.4	-0.0508	0.0254	0.0000	-0.5080	-0.0508	-0.1016	-0.0762	-0.5080	-0.4826
210	37.4	-0.0508	0.0000	0.0000	-0.4572	0.0508	-0.1270	-0.0508	-0.4572	-0.4318
240	65.1	0.0000	0.0254	0.1016	-0.4318	-0.0254	-0.1016	0.0508	-0.4318	-0.4572
270	103.6	0.0508	0.1016	0.1016	-0.3302	0.0254	-0.1270	0.0508	-0.2794	-0.3556
300	110.5	0.0508	0.1016	0.0000	-0.3302	0.0254	-0.1778	-0.1016	-0.3302	-0.3048
330	111.6	0.0508	0.1270	0.0000	-0.3302	0.0254	-0.1016	-0.0508	-0.3556	-0.4572
360	112.1	0.0508	0.1016	0.0000	-0.2794	0.0508	-0.1524	-0.0762	-0.3302	-0.3302
390	114.8	0.0762	0.1270	0.0508	-0.2540	0.0508	-0.1016	0.0508	-0.2540	-0.4064
420	145.2	0.1524	0.1524	0.1524	-0.2286	0.0762	-0.1778	0.1016	-0.1778	-0.2540
450	188.5	0.2032	0.2794	0.1016	-0.1778	0.1778	-0.1270	0.0762	-0.2286	-0.3556
480	216.8	0.3048	0.3302	0.2032	-0.0508	0.2286	-0.1270	-0.1016	-0.2286	-0.2540
510	222.7	0.3302	0.3556	0.0508	-0.0254	0.2794	-0.1524	-0.0762	-0.0762	-0.2032
540	222.7	0.3302	0.3556	0.0000	-0.0254	0.2794	-0.1270	-0.0762	-0.1524	-0.1778
570	223.7	0.3302	0.3556	0.0000	-0.0254	0.2794	-0.1524	-0.0762	-0.0762	-0.1524
600	245.6	0.3556	0.3556	0.0508	-0.0254	0.3302	-0.1524	-0.0762	-0.0508	-0.1524
630	268.6	0.4318	0.4318	0.1524	-0.1270	0.3302	-0.1524	-0.0508	-0.0254	-0.0762

TIME(sec) VLOAD(kN) D1(mm) D2(mm) CREEP(mm/min) G1(mm) G2(mm) T1(mm) T2(mm) T3(mm) T4(mm)

LOAD TEST NO. 2 - GROUTED H-PILE

TIME(sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	G1(mm)	G2(mm)	T1(mm)	T2(mm)	T3(mm)	T4(mm)
660	293.2	0.5334	0.4572	0.2032	0.1778	0.4064	0.1778	-0.1270	0.0762	-0.0762
690	314.0	0.5842	0.5334	0.1016	0.2540	0.4318	-0.1270	0.0254	0.1778	-0.0762
720	331.1	0.6604	0.5842	0.1524	0.2794	0.4826	0.1524	0.0762	0.1778	-0.0254
750	333.8	0.6604	0.5842	0.0000	0.3302	0.5080	0.1270	0.0254	0.2032	0.0000
780	333.8	0.6604	0.6096	0.0000	0.3556	0.5334	0.1778	0.0254	0.3048	0.0508
810	334.3	0.6858	0.6096	0.0508	0.4064	0.5080	0.1524	0.0508	0.2794	0.1016
840	349.2	0.7620	0.6604	0.1524	0.4572	0.5842	0.1524	0.1016	0.3048	0.1016
870	372.2	0.8382	0.8128	0.1524	0.6096	0.6858	0.1270	0.0000	0.3302	0.1270
900	403.7	1.0160	0.8890	0.3556	0.7874	0.7620	0.0254	0.1270	0.4572	0.1016
930	430.4	1.1684	1.0160	0.3048	0.9398	0.9144	0.0254	0.1524	0.6604	0.3810
960	441.6	1.2192	1.0668	0.1016	1.0414	0.9398	0.0508	0.2032	0.6858	0.4318
990	443.8	1.2192	1.0668	0.0000	1.0922	0.9906	0.0254	0.2032	0.7620	0.4826
1020	444.8	1.2446	1.0922	0.0508	1.1176	0.9906	0.0508	0.2032	0.7874	0.5080
1050	449.1	1.2700	1.1176	0.0508	1.1176	0.9906	0.0762	0.2540	0.8382	0.4826
1080	478.5	1.3462	1.1684	0.1524	1.1938	1.0668	0.0508	0.2032	0.7874	0.4318
1110	522.8	1.4986	1.3208	0.3048	1.2954	1.2192	0.0508	0.2286	0.8128	0.4826
1140	552.2	1.6002	1.4478	0.2032	1.3208	1.2954	0.0254	0.2032	0.8382	0.5588
1170	591.7	1.7526	1.5240	0.3048	1.3970	1.3970	0.0254	0.2032	0.9398	0.5842
1200	623.7	1.8288	1.6764	0.1524	1.4224	1.4986	0.0254	0.1524	1.0160	0.5842
1230	657.9	1.9558	1.7526	0.2540	1.5240	1.6256	0.0254	0.1778	1.0160	0.5588
1260	667.0	2.0574	1.8542	0.2032	1.5494	1.6510	0.0254	0.2286	1.1176	0.5588
1290	667.5	2.0828	1.8542	0.0508	1.5748	1.7018	0.0254	0.1778	0.9906	0.5588
1320	665.9	2.0828	1.8542	0.0000	1.5748	1.7018	0.0254	0.1524	1.0668	0.6604
1350	680.9	2.0828	1.8796	0.0000	1.6510	1.7272	0.0254	0.1778	1.0668	0.6096
1380	721.4	2.2606	2.0320	0.3556	1.7780	1.8542	0.0000	0.2286	1.3462	0.8382
1410	754.5	2.3876	2.1590	0.2540	1.9812	2.0066	0.0254	0.2794	1.3462	0.8890
1440	788.2	2.5908	2.3622	0.4064	2.1336	2.1336	0.1016	0.3302	1.5240	0.9652
1470	825.6	2.8194	2.5654	0.4572	2.3368	2.3622	0.1524	0.4064	1.7018	1.1176

LOAD TEST NO. 2 - GROUTED H-PILE

TIME(sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	G1(mm)	G2(mm)	T1(mm)	T2(mm)	T3(mm)	T4(mm)
1500	868.6	3.0988	2.7940	0.5588	2.5908	2.5146	0.2032	0.5334	2.0320	1.2700
1530	887.5	3.2004	2.8956	0.2032	2.7178	2.6670	0.2286	0.5334	1.9050	1.3208
1560	890.7	3.2258	2.9210	0.0508	2.7686	2.6924	0.1778	0.4826	2.0828	1.4986
1590	891.2	3.2258	2.9210	0.0000	2.8194	2.6924	0.1778	0.5588	2.1336	1.5240
1620	887.5	3.2512	2.9718	0.0508	2.8702	2.6924	0.2286	0.5588	2.2098	1.4478
1650	889.6	3.2766	2.9718	0.0508	2.8702	2.7178	0.2286	0.5080	2.2098	1.5240
1680	890.2	3.2766	3.0226	0.0000	2.8956	2.7432	0.2794	0.5842	2.2606	1.4732
1710	908.9	3.3528	3.0480	0.1524	2.9464	2.7940	0.2286	0.5588	2.3114	1.6002
1740	937.2	3.4798	3.1496	0.2540	3.0734	2.8448	0.2286	0.5842	2.3622	1.5748
1770	955.9	3.5560	3.2258	0.1524	3.0988	2.9464	0.2286	0.5842	2.3622	1.5494
1800	984.7	3.6576	3.3274	0.2032	3.1496	3.0226	0.2032	0.5334	2.3876	1.6764
1830	990.6	3.6830	3.3528	0.0508	3.1496	3.0480	0.2286	0.5842	2.4130	1.6256
1860	997.5	3.6830	3.3528	0.0000	3.1242	3.0480	0.1778	0.5588	2.4638	1.6256
1890	999.1	3.6830	3.4036	0.0000	3.0988	3.0734	0.2032	0.5588	2.4638	1.5748
1920	1001.8	3.7592	3.4036	0.1524	3.0734	3.0988	0.1524	0.5080	2.3876	1.5748
1950	1000.7	3.7338	3.4036	-0.0508	3.0734	3.0734	0.1524	0.5588	2.4130	1.6002
1980	998.0	3.7846	3.4544	0.1016	3.0734	3.0734	0.1524	0.5588	2.4384	1.5748
2010	1000.2	3.8100	3.4544	0.0508	3.0734	3.0734	0.1524	0.5588	2.4384	1.5494
2040	999.1	3.8100	3.4544	0.0000	3.0988	3.1242	0.1270	0.5588	2.5400	1.6256
2070	999.6	3.8100	3.4544	0.0000	3.1242	3.1242	0.1524	0.5588	2.4130	1.6256
2100	1000.7	3.8100	3.4798	0.0000	3.1750	3.1750	0.1778	0.5588	2.5146	1.6002
2130	1001.3	3.8608	3.5306	0.1016	3.3020	3.2258	0.2286	0.5842	2.6162	1.7018
2160	1002.3	3.9116	3.5814	0.1016	3.4290	3.2258	0.3302	0.7366	2.7178	1.8034
2190	999.1	3.9370	3.5814	0.0508	3.5052	3.2512	0.3302	0.6858	2.7940	1.8542
2220	999.1	3.9624	3.6322	0.0508	3.5560	3.3020	0.2794	0.6858	2.8448	1.9558
2250	999.1	3.9878	3.6576	0.0508	3.6576	3.3528	0.3810	0.7620	2.8956	1.9812
2280	1000.2	4.0132	3.6576	0.0508	3.6830	3.3528	0.3810	0.7112	2.8448	1.9812
2310	999.1	4.0132	3.6576	0.0000	3.7084	3.3528	0.3810	0.7366	2.9718	2.0574

LOAD TEST NO. 2 - GROUTED H-PILE

TIME(sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	G1(mm)	G2(mm)	T1(mm)	T2(mm)	T3(mm)	T4(mm)
2340	1015.7	4.0386	3.7084	0.0508	3.7592	3.3528	0.4064	0.7112	2.8956	2.0320
2370	1026.9	4.0894	3.7338	0.1016	3.8100	3.3782	0.3556	0.6858	2.9972	2.1336
2400	1043.4	4.1402	3.7846	0.1016	3.8862	3.4290	0.3810	0.7620	3.0226	2.1336
2430	1063.7	4.2164	3.8862	0.1524	3.9370	3.4798	0.3810	0.7366	3.2258	2.2606
2460	1083.5	4.3434	3.9624	0.2540	4.0132	3.6068	0.3810	0.7366	3.0988	2.1336
2490	1100.6	4.3942	4.0132	0.1016	4.0640	3.6576	0.3556	0.7366	3.2512	2.2606
2520	1110.2	4.4704	4.0894	0.1524	4.0640	3.6830	0.3810	0.7620	3.2004	2.1336
2550	1110.7	4.4958	4.1148	0.0508	4.0894	3.7338	0.3810	0.7620	3.4036	2.2606
2580	1111.3	4.5212	4.1148	0.0508	4.1148	3.7592	0.3810	0.7620	3.3274	2.2606
2610	1112.9	4.5212	4.1402	0.0000	4.1148	3.7846	0.3810	0.7620	3.3274	2.2860
2640	1111.3	4.5212	4.1656	0.0000	4.1148	3.7846	0.3810	0.7620	3.3274	2.2606
2670	1112.3	4.5466	4.1656	0.0508	4.1148	3.8100	0.3556	0.7620	3.3274	2.3114
2700	1110.7	4.5466	4.1910	0.0000	4.1148	3.8100	0.3556	0.7620	3.4036	2.3368
2730	1111.3	4.5466	4.1910	0.0000	4.1148	3.8100	0.3810	0.7366	3.3274	2.2860
2760	1112.3	4.5466	4.1910	0.0000	4.0640	3.8100	0.3810	0.7620	3.2766	2.1844
2790	1113.9	4.5466	4.1910	0.0000	4.0640	3.8100	0.3810	0.7620	3.3528	2.2352
2820	1113.9	4.5466	4.1910	0.0000	4.0640	3.8100	0.3556	0.7620	3.3274	2.2860
2850	1113.4	4.5466	4.1910	0.0000	4.0640	3.8100	0.3556	0.7620	3.3528	2.2860
2880	1111.3	4.5466	4.1910	0.0000	4.1148	3.8100	0.3810	0.8382	3.3274	2.2860
2910	1110.7	4.5466	4.1910	0.0000	4.0640	3.8100	0.3810	0.7874	3.3274	2.2098
2940	1111.3	4.5466	4.1910	0.0000	4.0640	3.8100	0.3556	0.7874	3.3274	2.2352
2970	1110.2	4.5466	4.1910	0.0000	4.0640	3.8100	0.3556	0.8128	3.4036	2.2860
3000	1129.4	4.5974	4.2418	0.1016	4.1148	3.8100	0.3302	0.7620	3.3528	2.2860
3030	1143.3	4.6736	4.3180	0.1524	4.1656	3.8608	0.3302	0.7366	3.3020	2.2860
3060	1155.6	4.7752	4.3688	0.2032	4.2926	3.9624	0.3810	0.8128	3.3782	2.3368
3090	1170.5	4.8514	4.4450	0.1524	4.3688	4.0894	0.4064	0.8636	3.5814	2.4638
3120	1191.9	4.9784	4.5720	0.2540	4.5466	4.1656	0.4318	0.9144	3.7338	2.5654
3150	1212.7	5.1054	4.6482	0.2540	4.6228	4.2164	0.4572	0.9398	3.7846	2.6416

LOAD TEST NO. 2 - GROUTED H-PILE

TIME(sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	G1(mm)	G2(mm)	T1(mm)	T2(mm)	T3(mm)	T4(mm)
3180	1222.9	5.1308	4.7498	0.0508	4.6990	4.2926	0.4318	0.9144	3.8354	2.6924
3210	1222.3	5.1308	4.7498	0.0000	4.6990	4.3180	0.4572	0.8890	3.7846	2.6162
3240	1222.9	5.1562	4.7752	0.0508	4.7244	4.3434	0.3810	0.8636	3.8608	2.7940
3270	1223.4	5.1816	4.7752	0.0508	4.7498	4.3942	0.4064	0.9144	3.9624	2.8448
3300	1222.9	5.2324	4.8260	0.1016	4.8006	4.3942	0.4826	0.9398	3.8608	2.7178
3330	1223.4	5.2578	4.8514	0.0508	4.8514	4.3942	0.4572	0.9906	4.0640	2.8956
3360	1222.9	5.2578	4.8514	0.0000	4.9022	4.3942	0.4318	0.9144	3.9878	2.8702
3390	1223.4	5.2578	4.8768	0.0000	4.9022	4.4196	0.4318	0.9398	4.0132	2.8448
3420	1223.4	5.2578	4.8768	0.0000	4.9276	4.4196	0.5080	0.9906	3.9878	2.7940
3450	1222.9	5.2832	4.8768	0.0508	4.9276	4.4196	0.5080	1.0922	4.0386	2.8702
3480	1223.4	5.2578	4.8768	-0.0508	4.9276	4.4196	0.5080	0.9906	4.0894	2.8956
3510	1223.9	5.2832	4.8768	0.0508	4.9276	4.4196	0.4826	0.9398	4.0386	2.8956
3540	1237.3	5.3086	4.9276	0.0508	4.9276	4.4196	0.4572	0.9652	4.0894	2.9718
3570	1232.2	5.3594	4.9530	0.1016	4.9784	4.5212	0.4826	0.9652	3.9878	2.8448
3600	1268.3	5.4356	5.0292	0.1524	5.0546	4.5466	0.5080	0.9906	4.1910	2.9972
3630	1298.8	5.5372	5.1054	0.2032	5.1562	4.6482	0.4318	0.9398	4.1402	2.9718
3660	1330.7	5.7912	5.3086	0.5080	5.3340	4.8514	0.5334	1.0414	4.3434	3.1496
3690	1333.4	5.8420	5.3594	0.1016	5.4102	4.9022	0.5334	1.0668	4.3720	3.2766
3720	1332.9	5.8928	5.4102	0.1016	5.4864	4.9530	0.5588	1.0922	4.5720	3.2258
3750	1335.5	5.9436	5.4864	0.1016	5.4864	4.9784	0.5842	1.1176	4.5212	3.1496
3780	1338.7	5.9690	5.4864	0.0508	5.5372	5.0038	0.5588	1.1430	4.6736	3.3020
3810	1336.1	5.9690	5.5118	0.0000	5.5372	5.0292	0.6096	1.1684	4.5974	3.2766
3840	1336.1	5.9944	5.4864	0.0508	5.5880	5.0038	0.5588	1.1176	4.7244	3.4036
3870	1334.5	5.9944	5.5118	0.0000	5.6134	5.0546	0.5842	1.0922	4.6990	3.3528
3900	1338.2	5.9944	5.5372	0.0000	5.6134	5.0800	0.5334	1.0922	4.7244	3.3782
3930	1335.0	6.0198	5.5626	0.0508	5.6134	5.0800	0.6096	1.2192	4.7498	3.4036
3960	1331.8	6.0198	5.5372	0.0000	5.6642	5.0800	0.5842	1.1684	4.7498	3.4798
3990	1330.2	6.0452	5.5626	0.0508	5.6642	5.0800	0.5842	1.2192	4.8006	3.4290

LOAD TEST NO. 2 - GROUTED H-PILE

TIME(sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	G1(mm)	G2(mm)	T1(mm)	T2(mm)	T3(mm)	T4(mm)
4020	1336.6	6.0706	5.5626	0.0508	5.7150	5.0546	0.6096	1.1684	4.3498	3.4798
4050	1334.5	6.0706	5.5626	0.0000	5.7404	5.1054	0.6604	1.2192	4.3498	3.4036
4080	1472.2	6.6548	6.0960	1.1684	6.1976	5.5880	0.6858	1.2446	5.1562	3.7846
4110	1556.6	7.2136	6.5786	1.1176	6.6294	6.0706	0.6858	1.3716	5.5626	4.0640
4140	1556.1	7.2898	6.6548	0.1524	6.7564	6.1468	0.7620	1.4224	5.6642	4.1148
4170	1558.2	7.3406	6.7310	0.1016	6.7818	6.1976	0.7366	1.4224	5.6642	4.1402
4200	1555.5	7.3406	6.7310	0.0000	6.8072	6.2230	0.7366	1.4224	5.7658	4.2418
4230	1558.2	7.3660	6.7818	0.0508	6.8326	6.2484	0.7366	1.4224	5.8420	4.2418
4260	1554.5	7.4168	6.7818	0.1016	6.8580	6.2484	0.7112	1.3462	5.7404	4.3434
4290	1556.6	7.4168	6.8072	0.0000	6.8834	6.2484	0.7366	1.3970	5.7404	4.2164
4320	1557.7	7.4422	6.8072	0.0508	6.9342	6.2738	0.7366	1.4478	5.8928	4.3180
4350	1559.3	7.4422	6.8580	0.0000	6.9342	6.2992	0.7366	1.3970	5.8166	4.3180
4380	1557.1	7.4676	6.8580	0.0508	6.9596	6.3246	0.7874	1.4478	5.9436	4.3688
4410	1553.9	7.4930	6.8580	0.0508	6.9342	6.3246	0.8382	1.4224	5.8674	4.3434
4440	1558.2	7.5184	6.8580	0.0508	6.9596	6.3246	0.7874	1.4478	5.8928	4.3434
4470	1557.1	7.5438	6.8580	0.0508	6.9596	6.3246	0.7620	1.4224	5.9436	4.4450
4500	1559.8	7.5438	6.8834	0.0000	7.0104	6.3246	0.7874	1.4732	5.9436	4.3688
4530	1670.9	7.9502	7.2898	0.8128	7.3406	6.7310	0.8128	1.4986	6.0960	4.5466
4560	1740.3	8.2296	7.6454	0.8128	7.6454	7.0612	0.8128	1.5748	6.4516	4.8260
4590	1780.9	8.6106	7.9248	0.5080	7.9248	7.2644	0.8636	1.6002	6.6802	5.0546
4620	1776.6	8.6614	7.9756	0.1016	8.0010	7.3152	0.8636	1.6002	6.8072	5.0800
4650	1779.8	8.7376	7.9756	0.1524	8.0264	7.4168	0.8382	1.6510	6.8072	5.1054
4680	1778.8	8.7630	8.0010	0.0508	8.0518	7.4422	0.8636	1.6002	6.8072	5.1054
4710	1779.3	8.7884	8.0264	0.0508	8.0518	7.4422	0.8382	1.6002	6.8580	5.1816
4740	1781.4	8.8138	8.0518	0.0508	8.0772	7.4930	0.8382	1.6256	6.9088	5.1816
4770	1780.4	8.8392	8.0772	0.0508	8.1026	7.4930	0.8382	1.6256	6.9596	5.1816
4800	1778.2	8.8392	8.0772	0.0000	8.1280	7.5438	0.8128	1.6002	6.9088	5.1562
4830	1778.2	8.8900	8.0772	0.1016	8.1280	7.5438	0.8128	1.6002	6.9596	5.2832

LOAD TEST NO. 2 - GROUTED H-PILE

TIME(sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	G1(mm)	G2(mm)	T1(mm)	T2(mm)	T3(mm)	T4(mm)
4860	1777.7	8.8646	8.1026	-0.0508	8.1280	7.5438	0.8636	1.6002	6.9088	5.1816
4890	1776.1	8.8900	8.1026	0.0508	8.1534	7.5438	0.8636	1.6510	6.9850	5.2324
4920	1782.5	8.8900	8.1026	0.0000	8.1534	7.5438	0.8636	1.6510	6.9596	5.2578
4950	1783.0	8.8900	8.1026	0.0000	8.1534	7.5946	0.8890	1.5494	6.9342	5.2324
4980	1778.8	8.9154	8.1280	0.0508	8.1788	7.5946	0.8890	1.6002	6.8834	5.1816
5010	1782.0	8.9154	8.1280	0.0000	8.1280	7.5946	0.8382	1.6002	6.9342	5.1816
5040	1782.5	8.9154	8.1280	0.0000	8.1788	7.5946	0.8890	1.6256	6.9342	5.2578
5070	1786.2	8.8900	8.1280	-0.0508	8.1788	7.5946	0.7874	1.6002	7.0358	5.3594
5100	1784.1	8.9662	8.1280	0.1524	8.1534	7.5946	0.8890	1.5748	6.8834	5.2324
5130	1784.1	8.9662	8.1534	0.0000	8.1534	7.5946	0.8382	1.6510	6.9850	5.2578
5160	1778.8	8.9916	8.1534	0.0508	8.1534	7.5946	0.7874	1.5748	6.9088	5.2578
5190	1779.3	9.0170	8.1788	0.0508	8.1534	7.6454	0.8890	1.6002	6.9850	5.2578
5220	1938.4	9.5504	8.7122	1.0668	8.6614	8.1280	0.8382	1.6764	7.3406	5.6896
5250	2001.4	10.0584	9.1186	1.0160	9.0424	8.5344	0.9652	1.7526	7.6962	5.8674
5280	2002.0	10.1346	9.2202	0.1524	9.1186	8.6106	0.9144	1.7526	7.8232	6.0198
5310	2003.0	10.2108	9.2710	0.1524	9.1694	8.6106	0.9398	1.7526	7.8740	6.0452
5340	2002.0	10.2362	9.3218	0.0508	9.1694	8.7122	0.9652	1.8034	7.8994	6.0960
5370	2002.5	10.2870	9.3472	0.1016	9.2202	8.7122	0.9652	1.7526	7.9248	6.1468
5400	1999.8	10.3124	9.3472	0.0508	9.2202	8.7122	0.9652	1.8034	7.8740	6.0706
5430	2002.0	10.3124	9.3726	0.0000	9.2202	8.7122	1.0160	1.8288	7.9756	6.1468
5460	2003.0	10.3378	9.3726	0.0508	9.2456	8.7630	0.8890	1.7526	7.9248	6.1722
5490	1997.7	10.3378	9.3726	0.0000	9.2456	8.7630	0.9652	1.7780	8.0010	6.1722
5520	1997.2	10.3632	9.3726	0.0508	9.2710	8.7630	0.9652	1.7780	8.0010	6.1722
5550	1999.8	10.3632	9.3980	0.0000	9.2964	8.8138	0.9652	1.7780	8.0010	6.1976
5580	2000.9	10.3886	9.4234	0.0508	9.3218	8.7884	0.9398	1.7780	8.0518	6.2484
5610	2003.6	10.4140	9.4234	0.0508	9.3472	8.8392	0.9652	1.7780	8.1026	6.2230
5640	2067.6	10.6426	9.6266	0.4572	9.5504	8.9662	0.9144	1.7780	8.2042	6.4262
5670	2076.2	10.6934	9.7282	0.1016	9.6266	9.0678	1.0160	1.9050	8.3566	6.5024

LOAD TEST NO. 2 - GROUTED H-PILE

TIME(sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	G1(mm)	G2(mm)	T1(mm)	T2(mm)	T3(mm)	T4(mm)
5700	2075.7	10.7950	9.7536	0.2032	9.6774	9.0932	0.9906	1.9050	8.3820	6.5532
5730	2118.4	10.9982	9.9822	0.4064	9.8298	9.3216	1.0160	1.9050	8.5344	6.6348
5760	2201.1	11.4300	10.3124	0.8636	10.2108	9.6520	1.0668	1.9304	8.8900	7.0104
5790	2229.5	11.6586	10.5918	0.4572	10.4140	9.9314	1.0668	2.0320	9.0424	7.1120
5820	2233.2	11.7856	10.6426	0.2540	10.5156	10.0330	1.0668	1.9304	9.1186	7.1882
5850	2147.2	11.7856	10.6426	0.0000	10.4140	10.0584	1.2192	2.1590	9.1440	7.1882
5880	2137.1	11.7856	10.6426	0.0000	10.3886	10.0330	1.2192	2.1082	8.8900	7.2136
5910	2194.7	11.7856	10.6680	0.0000	10.4648	10.0584	1.1684	2.1082	8.9916	7.2390
5940	2218.8	11.8872	10.7442	0.2032	10.5410	10.0838	1.1938	2.1082	9.0424	7.2644
5970	2220.4	11.9126	10.7442	0.0508	10.5918	10.0838	1.1938	2.1082	9.0170	7.2390
6000	2219.8	11.9634	10.7696	0.1016	10.5918	10.1346	1.1938	2.1336	9.1186	7.2898
6030	2219.3	11.9888	10.7696	0.0508	10.5918	10.1346	1.2192	2.1336	9.1186	7.2644
6060	2217.7	11.9888	10.7950	0.0000	10.6172	10.1854	1.1938	2.1082	9.1186	7.2898
6090	2232.7	12.0650	10.8458	0.1524	10.6934	10.2108	1.1938	2.1082	9.1694	7.3406
6120	2222.5	12.0396	10.8712	0.0508	10.6680	10.2362	1.1938	2.1336	9.1694	7.3406
6150	2226.2	12.0904	10.8458	0.1016	10.6934	10.2108	1.1938	2.1082	9.1948	7.3914
6180	2223.6	12.0904	10.8712	0.0000	10.6934	10.2362	1.1938	2.0828	9.0932	7.3152
6210	2222.0	12.0904	10.8712	0.0000	10.6934	10.2616	1.2192	2.1336	9.2202	7.3406
6240	2224.1	12.0904	10.8712	0.0000	10.6934	10.2616	1.1430	2.1082	9.1948	7.4168
6270	2224.6	12.1158	10.8712	0.0508	10.7188	10.2616	1.1430	2.1082	9.1948	7.4168
6300	2224.1	12.1158	10.8712	0.0000	10.7188	10.2616	1.1684	2.1336	9.2964	7.5438
6330	2224.1	12.1158	10.8712	0.0000	10.7188	10.2616	1.1938	2.1082	9.1948	7.4168
6360	2210.2	12.1158	10.8712	0.0000	10.6934	10.2616	1.1176	2.1082	9.1948	7.4930
6390	2210.8	12.1158	10.8712	0.0000	10.6934	10.3124	1.1684	2.0828	9.1186	7.3914
6420	2223.0	12.1158	10.8712	0.0000	10.6934	10.2616	1.1430	2.1082	9.2202	7.4930
6450	2224.6	12.1412	10.8712	0.0508	10.7188	10.2870	1.1938	2.1336	9.2456	7.4422
6480	2223.0	12.1412	10.8712	0.0000	10.7188	10.2870	1.1938	2.1590	9.2456	7.4168
6510	2225.2	12.1666	10.8712	0.0508	10.7188	10.3124	1.1430	2.1082	9.1694	7.3660

LOAD TEST NO. 2 - GROUTED H-PILE

TIME(sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	G1(mm)	G2(mm)	T1(mm)	T2(mm)	T3(mm)	T4(mm)
6540	2234.1	12.1660	10.8966	0.0000	10.7188	10.3124	1.1430	2.1590	9.2202	7.4676
6570	2232.5	12.1666	10.8712	0.0000	10.7442	10.2870	1.1430	2.1082	9.2202	7.5914
6600	2371.0	12.6746	11.3558	1.0160	11.2014	10.7442	1.1938	2.1590	9.6774	7.8232
6630	2418.5	12.9794	11.6586	0.6096	11.4554	10.9982	1.1176	2.1082	9.8552	8.0772
6660	2439.5	13.1826	11.8110	0.4064	11.5824	11.1506	1.1176	2.1590	10.0838	8.2550
6690	2442.5	13.2350	11.9126	0.3048	11.7348	11.3030	1.1938	2.2860	10.1854	8.3566
6720	2434.5	13.3858	11.9634	0.1016	11.7348	11.3538	1.1938	2.2098	10.1854	8.3058
6750	2422.8	13.4112	11.9634	0.0508	11.7348	11.3538	1.1684	2.2098	10.1600	8.3312
6780	2419.0	13.3604	11.9634	-0.1016	11.7348	11.3538	1.2192	2.2606	10.2108	8.3820
6810	2409.4	13.3858	11.9634	0.0508	11.7602	11.3538	1.2192	2.2606	10.2616	8.4328
6840	2405.0	13.4112	11.9634	0.0508	11.7602	11.3538	1.1938	2.1590	10.1600	8.4074
6870	2405.1	13.4112	11.9634	0.0000	11.7856	11.3538	1.1684	2.1844	10.1854	8.4074
6900	2431.6	13.5890	12.1158	0.5556	11.9380	11.4808	1.2192	2.3114	10.4140	8.6106
6930	2449.5	13.6652	12.1412	0.1524	11.9888	11.5316	1.1938	2.3606	10.3124	8.5852
6960	2443.6	13.6906	12.1412	0.0508	11.9888	11.5316	1.2192	2.3860	10.3124	8.5852
6990	2447.9	13.6906	12.1412	0.0000	12.0142	11.5570	1.2192	2.3114	10.4140	8.6868
7020	2447.9	13.6906	12.1412	0.0000	12.0142	11.5570	1.1938	2.3352	10.3124	8.6360
7050	2450.5	13.7160	12.1920	0.0508	12.0142	11.5570	1.2446	2.3860	10.3886	8.5852
7080	2451.1	13.7160	12.1920	0.0000	12.0650	11.6078	1.2446	2.3860	10.5410	8.6614
7110	2452.1	13.7160	12.1920	0.0000	12.0904	11.5824	1.2192	2.3860	10.4140	8.6614
7140	2507.1	14.0386	12.4714	0.6096	12.2936	11.8364	1.2700	2.5622	10.6172	8.9408
7170	2535.7	14.2748	12.6492	0.3810	12.4460	12.0650	1.3462	2.4384	10.6680	8.9662
7200	2565.9	14.3002	12.7762	0.4318	12.5476	12.1158	1.3208	2.3876	10.7442	9.1186
7230	2551.5	14.3256	12.7762	0.0000	12.5476	12.1158	1.3462	2.4384	10.7950	9.1186
7260	2562.1	14.4272	12.8016	0.3810	12.5730	12.1666	1.3208	2.4130	10.7188	9.1186
7290	2560.5	14.4526	12.8016	0.0508	12.5730	12.1666	1.3716	2.4384	10.7696	9.1186
7320	2570.5	14.4526	12.8016	0.0000	12.5730	12.2174	1.3208	2.4384	10.8712	9.1186
7350	2568.5	14.5034	12.8524	0.1016	12.5730	12.2682	1.3970	2.4130	10.8204	9.1440

LOAD TEST NO. 2 - GROUTED H-PILE

TIME(sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	G1(mm)	G2(mm)	T1(mm)	T2(mm)	T3(mm)	T4(mm)
7380	2567.5	14.5268	12.8778	0.0508	12.5984	12.3682	1.2954	2.4384	10.7950	9.1186
7410	2555.7	14.5542	12.8524	0.0508	12.5476	12.2936	1.3462	2.4384	10.8458	9.1948
7440	2562.7	14.5288	12.8778	0.0508	12.5476	12.3956	1.3208	2.4130	10.8966	9.1694
7470	2561.6	14.5542	12.8778	0.0508	12.5476	12.2936	1.3208	2.4130	10.7950	9.1186
7500	2557.3	14.5796	12.9032	0.0508	12.5476	12.2936	1.3462	2.4384	10.7950	9.1694
7530	2554.7	14.5796	12.9032	0.0000	12.5730	12.2936	1.2954	2.4384	10.8966	9.2456
7560	2553.6	14.5796	12.9032	0.0000	12.5476	12.3190	1.2954	2.3622	10.6934	9.1186
7590	2553.6	14.6050	12.9032	0.0508	12.5476	12.2936	1.2954	2.4130	10.7950	9.1440
7620	2560.9	14.6304	12.9286	0.0508	12.6238	12.2936	1.2446	2.3622	10.7696	9.1948
7650	2565.3	14.6812	12.9286	0.1016	12.6492	12.3952	1.2700	2.4130	10.8966	9.2202
7680	2550.4	14.6812	12.9286	0.0000	12.6492	12.3952	1.2954	2.4130	10.8712	9.1440
7710	2548.8	14.6812	12.9286	0.0000	12.6238	12.3952	1.2954	2.4130	10.9728	9.2964
7740	2556.8	14.6812	12.9286	0.0000	12.6492	12.3952	1.3208	2.3876	10.8204	9.1186
7770	2553.6	14.7066	12.9286	0.0508	12.6492	12.3952	1.2700	2.3876	10.8204	9.2456
7800	2556.3	14.6812	12.9540	0.0508	12.6238	12.3952	1.2700	2.3876	10.8966	9.2456
7830	2558.4	14.6812	12.9286	0.0000	12.6238	12.3952	1.2954	2.4130	10.8966	9.1694
7860	2559.3	14.7066	12.9540	0.0508	12.6238	12.3952	1.2954	2.3876	10.8458	9.1948
7890	2556.8	14.7066	12.9286	0.0000	12.6492	12.3952	1.3462	2.3876	10.9220	9.2710
7920	2558.4	14.7066	12.9286	0.0000	12.6238	12.3952	1.2446	2.3622	10.8712	9.2456
7950	2550.9	14.7066	12.9286	0.0000	12.6492	12.3952	1.3208	2.4130	10.8966	9.2456
7980	2458.4	14.6050	12.8778	-0.2032	12.5476	12.2936	1.2700	2.4384	10.8966	9.2456
8010	2271.1	14.1986	12.4714	-0.8128	12.1920	11.8634	1.2954	2.3368	10.4648	8.9408
8040	2232.1	14.1224	12.3698	-0.1524	12.0904	11.8110	1.2700	2.2860	10.5410	8.9662
8070	2215.0	14.0716	12.3190	-0.1016	12.0650	11.7348	1.2954	2.3622	10.5664	8.9662
8100	2217.7	14.0462	12.3190	0.0508	12.0650	11.7348	1.2954	2.3876	10.5410	8.9662
8130	2214.0	14.0208	12.3190	0.0508	12.0650	11.7348	1.2954	2.3622	10.5410	8.9662
8160	2044.7	13.6144	11.8872	-0.8128	11.6840	11.3792	1.2446	2.2860	10.3378	8.8138
8190	1699.2	12.8270	11.1252	-1.5748	10.8966	10.6934	1.2954	2.2860	9.8044	8.4836

LOAD TEST NO. 2 - GROUTED H-PILE

8220	1776.6	12.6746	11.1506	-0.3048	10.9220	10.6173	1.2700	2.2098	9.7028	8.4074
8250	1783.0	12.7000	11.1506	0.0508	10.9220	10.6426	1.3208	2.2352	9.7028	8.4074
8280	1475.4	11.6332	10.1600	-2.1336	9.9822	9.6266	1.2954	2.1590	8.9916	7.8994
8310	1348.4	11.1252	9.6012	-1.0160	9.5504	9.1948	1.2700	2.1082	8.5598	7.5946
8340	1340.9	11.0490	9.5504	-0.1524	9.4742	9.0932	1.1938	2.0320	8.5344	7.6200
8370	1034.2	9.8266	8.2804	-2.8448	8.3058	7.8994	1.2192	1.9558	7.4930	6.8326
8400	888.6	8.7884	7.5438	-1.0764	7.6200	7.2136	1.2192	1.9304	6.9088	6.4770
8430	891.8	8.8138	7.5438	0.0000	7.6200	7.2136	1.1938	1.9050	6.9342	6.5278
8460	700.1	7.2644	6.1214	-3.0988	6.3246	5.8166	1.1430	1.8034	5.7912	5.0674
8490	452.8	6.2738	5.3086	-1.9812	5.5372	5.0038	1.1684	1.8288	5.2832	5.3594
8520	445.9	6.1976	5.2324	-0.1524	5.4864	4.9530	1.1176	1.7526	5.1562	5.2578
8550	21.9	3.6322	3.1496	-5.1308	3.4290	2.8702	1.0668	1.4224	3.6576	4.1402
8580	11.3	3.2258	3.0226	-0.8128	3.3274	2.7178	1.0922	1.6002	3.6068	3.9370
8610	0.0	3.1496	2.9718	0.1524	3.2766	2.6670	1.1430	1.6002	3.4798	3.8354
8640	0.0	3.1242	2.9464	0.0508	3.2512	2.6670	1.1176	1.6002	3.4290	3.8354

TIME(sec) VLOAD(kN) D1(mm) D2(mm) CREEP(mm/min) G1(mm) G2(mm) T1(mm) T2(mm) T3(mm) T4(mm)

LOAD TEST NO.3 - GROUTED PIPE-PILE

GROUTED PILE LOAD TEST - CRANBERRY JCT

LOAD TEST #3

The time is 09:17:39:68

The date is 2-01-1990

TIME	VLOAD	D1	D2	CREEP	G1	G2	T1	T2	T3	T4
SEC	(KN)	(MM)	(MM)	(MM/MIN)	(MM)	(MM)	(MM)	(MM)	(MM)	(MM)
0	0	-0.9154	11.43	0	14.4272	12.4714	-4.9022	-40.0558	-19.5070	-14.351
30	0.534	0	0	17.8308	0.0254	0	0	0.127	-19.4076	-13.4874
60	0.534	-0.0254	0	-0.0508	0.0254	0	0	0.1524	-19.3802	-13.4874
90	0.534	-0.0254	0	0	0.0508	0	-0.0762	0.0254	-19.431	-13.5382
120	0.534	0	0	0.0508	0.0254	0.0254	-0.0508	0.1016	-19.431	-13.4874
150	88.712	-0.0254	0.0762	-0.0508	0.0762	0.0254	-0.0254	0.127	-19.431	-13.589
180	181.026	-0.0254	0.6858	0	0.2032	0.254	0	0.2032	-19.3680	-13.462
210	223.213	-0.0254	0.7366	0	0.2032	0.3048	-0.0254	0.127	-19.4056	-13.5128
240	222.678	-0.0254	0.7874	0	0.2032	0.3048	0	0.1778	-19.431	-13.5128
270	222.144	-0.0254	0.762	0	0.2032	0.3302	-0.0254	0.1778	-19.4056	-13.4366
300	221.61	-0.0254	0.7874	0	0.2032	0.3048	0.0508	0.2032	-19.3802	-13.5128
330	221.076	0	0.7874	0.0508	0.2032	0.3048	0.0762	0.254	-19.4056	-13.5636
360	220.542	-0.0254	0.7874	-0.0508	0.2032	0.3556	0.0508	0.2032	-19.4056	-13.5128
390	220.008	-0.0254	0.7874	0	0.2032	0.3556	0	0.2032	-19.4056	-13.4874
420	220.008	-0.0254	0.7874	0	0.254	0.3556	0.0254	0.1778	-19.3802	-13.5128
450	219.474	-0.0254	0.7874	0	0.254	0.3556	0	0.1524	-19.431	-13.5382
480	404.772	0.8636	1.1684	1.778	0.8636	0.6858	0.0254	0.2032	-19.4056	-13.462
510	445.89	0.8636	1.1684	0	0.9398	0.7874	0.0508	0.2794	-19.3802	-13.4874
540	444.822	0.8636	1.1684	0	0.9652	0.7874	0.0762	0.2794	-19.4056	-13.5382
570	444.822	0.8636	1.1684	0	1.016	0.7874	0	0.254	-19.3802	-13.4874
600	509.436	1.1684	1.1684	0.0996	1.2192	0.9398	0	0.2286	-19.431	-13.5382
630	649.878	1.6002	1.6002	0.8636	1.651	1.27	-0.0762	0.2286	-19.4056	-13.5128

TIME(sec) VLOAD(kN) D1(mm) D2(mm) CREEP(mm/min) G1(mm) G2(mm) T1(mm) T2(mm) T3(mm) T4(mm)

LOAD TEST NO.3 - GROUTED PIPE-PILE

TIME(sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	G1(mm)	G2(mm)	T1(mm)	T2(mm)	T3(mm)	T4(mm)
660	666.966	1.5748	1.5748	-0.0508	1.7272	1.3462	0.2032	0.1778	-19.3802	-13.462
690	666.966	1.5748	1.5748	0	1.7272	1.3462	0.2032	0.2286	-19.3802	-13.4874
720	668.034	1.5748	1.5748	0	1.7272	1.3462	0.2032	0.2032	-19.4056	-13.5128
750	784.98	2.8194	2.8194	2.4892	2.5146	1.651	0.3048	0.1778	-19.431	-13.5383
780	884.838	2.8194	2.8194	0	2.8924	1.9812	-0.4064	0.1778	-19.5082	-13.4566
810	890.178	2.8194	2.8194	0	2.7432	2.0828	0.4318	0.254	-19.3802	-13.5128
840	888.376	2.8194	2.8194	0	2.8194	2.0828	-0.508	0.3302	-19.431	-13.5128
870	975.084	3.8608	3.8608	2.0828	3.9052	2.286	-0.5334	0.3302	-19.3802	-13.5128
900	1087.758	4.0132	4.0132	0.3048	3.81	2.794	-0.7112	0.381	-19.4056	-13.5382
930	1112.322	4.064	4.064	0.1016	3.937	2.9972	-0.7366	0.5334	-19.3802	-13.5128
960	1113.924	4.6736	4.6736	1.2192	4.318	3.048	-0.8128	0.4572	-19.3802	-13.4874
990	1111.788	4.6736	4.6736	0	4.3434	3.0734	-0.8382	0.5588	-19.3802	-13.4874
1020	1111.788	4.6736	4.6736	0	4.3434	3.0988	-0.889	0.4826	-19.3548	-13.4874
1050	1112.322	4.6736	4.6736	0	4.3434	3.1242	-0.8636	0.508	-19.4056	-13.5383
1080	1111.788	4.6736	4.6736	0	4.3434	3.1242	-0.8636	0.4572	-19.3802	-13.4874
1110	1113.39	4.6736	4.6736	0	4.3434	3.1242	-0.8636	0.508	-19.4056	-13.5382
1140	1111.254	4.6736	4.6736	0	4.3434	3.1242	-0.8636	0.5334	-19.3802	-13.4874
1170	1106.982	4.6736	4.6736	0	4.4196	3.1242	-0.9144	0.381	-19.431	-13.5383
1200	1110.186	4.6736	4.6736	0	4.4196	3.175	-0.9398	0.4572	-19.431	-13.589
1230	1111.788	4.6736	4.6736	0	4.4196	3.175	-0.9652	0.4826	-19.3802	-13.4874
1260	1111.254	4.6736	4.6736	0	4.3942	3.175	-1.016	0.4826	-19.3548	-13.4566
1290	1112.322	4.6736	4.6736	0	4.3942	3.175	-0.9144	0.5588	-19.3548	-13.5128
1320	1111.254	4.6736	4.6736	0	4.445	3.175	-0.9652	0.5334	-19.3802	-13.5128
1350	1111.254	4.6736	4.6736	0	4.445	3.175	-1.0414	0.4572	-19.3802	-13.5128
1380	1110.72	4.6736	4.6736	0	4.445	3.175	-0.9398	0.5334	-19.3802	-13.5382
1410	1261.308	6.0706	6.0706	3.794	5.334	3.81	-1.1684	0.5334	-19.3802	-13.5128
1440	1330.194	6.3754	6.3754	0.6096	5.9182	4.4704	-1.1938	0.7366	-19.3548	-13.462
1470	1335	6.5278	6.5278	0.3048	6.0706	4.699	-1.2192	0.8636	-19.4056	-13.5382

LOAD TEST NO.3 - GROUTED PIPE-PILE

TIME(sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	G1(mm)	G2(mm)	T1(mm)	T2(mm)	T3(mm)	T4(mm)
1500	1334.466	6.5552	6.5552	0.0508	6.1214	4.7752	1.2192	0.9398	-19.4056	13.4366
1530	1338.204	7.747	7.4422	2.3876	6.8326	6.2484	0.254	2.4892	-19.3802	13.4874
1560	1334.466	7.747	7.5184	0	6.8326	6.2738	0.2032	2.5146	-19.3548	13.4874
1590	1332.864	7.747	7.5692	0	6.858	6.2992	0.1778	2.5654	-19.3548	13.4112
1620	1335.534	7.747	7.6454	0	6.9088	6.35	0.254	2.5654	-19.3802	13.4366
1650	1331.796	7.7978	7.6708	0.1016	6.985	6.4262	0.1778	2.5654	-19.431	13.4874
1680	1333.398	7.8486	7.6962	0.1016	7.0104	6.4516	0.2032	2.5654	-19.431	13.4874
1710	1336.068	7.8994	7.7216	0.1016	7.0358	6.5278	0.254	2.6924	-19.3802	13.462
1740	1334.466	7.9756	7.747	0.1524	7.0866	6.5278	0.2794	2.6416	-19.4056	-13.462
1770	1332.864	8.1534	7.874	0.3556	7.1882	6.6548	0.3302	2.7432	-19.3802	-13.462
1800	1337.136	8.1534	7.874	0	7.1628	6.6548	0.3302	2.7178	-19.3548	13.4366
1830	1335.534	8.1534	7.8994	0	7.2136	6.6548	0.3302	2.7686	-19.3802	13.4112
1860	1331.796	8.1534	7.9502	0	7.2136	6.6548	0.381	2.7686	-19.3802	-13.5128
1890	1478.646	8.4836	8.89	0.6604	7.7216	7.5184	0.3302	2.8702	-19.3802	13.462
1920	1521.366	8.5852	9.3726	0.2032	8.0264	8.1534	0.254	2.9972	-19.4056	13.462
1950	1557.678	8.5852	9.4742	0	8.255	8.5852	0.2286	3.1242	-19.3802	-13.4874
1980	1557.144	8.5596	9.4742	-0.0508	8.3312	8.7884	0.1524	3.0734	-19.3548	-13.4366
2010	1557.144	8.5852	9.4742	0.0508	8.4074	8.89	0.1016	3.048	-19.3294	-13.4112
2040	1557.678	8.6106	9.4742	0.0508	8.4582	8.9154	0.0762	3.0988	-19.3802	-13.4366
2070	1556.076	8.5852	9.4488	-0.0508	8.4582	8.9916	0.0762	3.1496	-19.3548	-13.4366
2100	1555.008	8.6106	9.4742	0.0508	8.4836	9.017	0.0762	3.3004	-19.3802	-13.462
2130	1558.212	8.5852	9.4488	-0.0508	8.509	9.0678	0.0254	3.2258	-19.3294	-13.4112
2160	1556.076	8.5852	9.4742	0	8.5852	9.1186	0.0254	3.2258	-19.3802	-13.4112
2190	1555.542	8.5852	9.4742	0	8.5852	9.144	-0.0254	3.1496	-19.4056	-13.462
2220	1555.542	8.5852	9.4742	0	8.5598	9.1694	0.0254	3.2258	-19.3802	-13.462
2250	1556.076	8.5852	9.4742	0	8.5852	9.1694	0.0254	3.2512	-19.4056	-13.4874
2280	1555.542	8.6106	9.4742	0.0508	8.6868	9.2202	0	3.2766	-19.3802	-13.4366
2310	1555.542	8.6106	9.4742	0	8.636	9.2456	-0.0254	3.2512	-19.3548	-13.462

LOAD TEST NO.3 - GROUTED PIPE-PILE

TIME(sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	G1(mm)	G2(mm)	T1(mm)	T2(mm)	T3(mm)	T4(mm)
2340	1558.212	8.5596	9.4742	0.1016	8.6868	9.2964	0.0254	3.2258	-19.3802	13.462
2370	1557.678	8.5852	9.4742	0.0508	8.6868	9.2964	0.0254	3.2004	-19.4056	13.462
2400	1555.008	8.5852	11.6586	2.9972	9.398	9.8552	0.508	3.9878	-19.3548	13.462
2430	1558.746	8.5852	13.1064	0	9.398	9.906	0.5334	3.937	-19.3802	13.5128
2460	1559.28	8.4074	9.4234	4.0132	9.7536	9.906	0.4826	3.8862	-19.3548	13.462
2490	1558.212	8.4582	9.4742	0.1016	9.8044	9.9314	0.4826	3.8862	-19.3802	13.462
2520	1556.076	8.4836	9.4488	0.0508	9.8298	9.9314	0.4318	3.8354	-19.3802	13.462
2550	1555.542	8.5344	9.4742	0.1016	9.8044	9.9314	0.5334	3.9624	-19.3802	-13.5128
2580	1558.212	8.5344	9.4996	0	9.8298	9.9568	0.4826	3.9116	-19.3802	-13.5128
2610	1555.542	8.5598	9.5504	0.0508	9.8298	10.0076	0.4826	3.8862	-19.3802	-13.4366
2640	1556.61	8.5852	9.6012	0.0508	9.9822	10.033	0.4826	3.937	-19.3802	-13.5128
2670	1557.144	8.636	9.6012	0.1016	9.9314	10.033	0.4826	3.8862	-19.3802	13.462
2700	1557.144	8.636	9.6266	0	9.9568	10.0838	0.5588	3.937	-19.3802	13.4874
2730	1555.542	8.6362	9.6774	0.4064	10.0838	10.1346	0.508	3.8862	-19.3802	13.462
2760	1555.542	8.6362	9.6774	0	10.0838	10.1346	0.5334	4.0132	-19.3802	-13.5128
2790	1555.542	8.6362	9.7282	0	10.0584	10.1346	0.5334	4.0132	19.3802	-13.5382
2820	1559.28	8.6362	9.7282	0	10.0838	10.1854	0.508	3.9878	-19.3548	-13.4366
2850	1556.61	8.6616	9.7536	0.2032	10.2108	10.2362	0.508	4.0132	-19.3802	-13.4874
2880	1555.008	9.0678	9.8552	0.254	10.2616	10.3124	0.5588	4.0132	-19.3802	13.4874
2910	1557.144	9.3456	9.8806	0.3556	10.414	10.287	0.4826	3.9624	-19.4056	-13.4366
2940	1557.144	9.2202	9.8806	-0.0508	10.3632	10.3124	0.5842	4.1148	-19.3294	13.4366
2970	1558.746	9.3456	9.8806	0.0508	10.414	10.287	0.5588	4.0386	-19.3548	-13.462
3000	1558.746	9.3456	9.8806	0	10.414	10.3124	0.508	3.9624	-19.3802	13.4366
3030	1662.870	9.7282	10.6426	0.9652	10.9728	10.9728	0.5334	4.191	19.3548	13.462
3060	1758.704	11.2014	12.319	2.9464	12.2936	12.4968	0.5588	4.3974	-19.304	-13.4113
3090	1778.754	12.0142	13.1064	1.6256	13.081	13.2588	0.508	4.699	-19.304	13.4366
3120	1778.754	13.0048	13.462	1.9812	13.7668	13.6906	0.6604	4.9022	-19.3294	13.4874
3150	1779.822	13.1318	13.6652	0.254	13.9954	13.9954	0.6604	4.9784	19.3294	13.462

LOAD TEST NO.3 - GROUTED PIPE-PILE

TIME(sec)	VLOAD(kN)	D1(mm)	D2(mm)	CREEP(mm/min)	G1(mm)	G2(mm)	T1(mm)	T2(mm)	T3(mm)	T4(mm)
3180	1779.288	13.6906	13.7668	1.1176	14.351	14.1478	0.5334	4.9022	-19.3294	-13.4366
3210	1779.822	13.9954	13.843	0.6096	14.6812	14.3764	0.508	4.9784	-19.3548	-13.4366
3240	1779.288	13.9954	13.843	0	14.6812	14.4526	0.508	5.0292	-19.3548	-13.462
3270	1777.686	14.0208	13.8938	0.0508	14.7574	14.605	0.4572	5.0038	-19.3294	-13.4874
3300	1775.55	14.0208	14.0716	0	14.8082	14.7574	0.5334	5.0038	-19.3548	-13.4874
3330	1780.89	14.0716	14.1478	0.1016	14.9606	14.9352	0.4572	4.9784	-19.3548	-13.4874
3360	1780.356	14.224	14.351	0.3048	15.113	15.24	0.4572	5.08	-19.3294	-13.4874
3390	1777.152	14.9606	15.8496	1.4732	15.6464	15.7734	0.6604	5.3848	-19.2786	-13.4366
3420	1778.22	15.367	16.2052	0.8128	16.0274	16.129	0.635	5.334	-19.3802	-13.4112
3450	1778.22	15.621	16.4592	0.508	16.2814	16.4084	0.7112	5.5626	-19.3548	-13.5128
3480	1779.288	15.748	16.764	0.254	16.4338	16.637	0.7366	5.6642	-19.3294	-13.4366
3510	1779.822	16.0528	17.1704	0.6096	16.7132	17.018	0.6858	5.6134	-19.3294	-13.4112
3540	1778.754	16.3576	17.5514	0.6096	17.018	17.4244	0.7112	5.7912	-19.3548	-13.4112
3570	1776.618	16.6624	17.9832	0.6096	17.2974	17.8054	0.6858	5.6896	-19.3294	-13.4366
3600	1778.22	17.145	18.3642	0.9652	17.7546	18.2626	0.6858	5.842	-19.3802	-13.4874
3630	1777.686	17.4752	19.05	0.6604	18.0594	18.669	0.6604	5.8928	-19.3294	-13.4112
3660	1779.288	17.907	19.4818	0.8636	18.2626	18.9738	0.7366	5.9436	-19.3294	-13.4366
3690	1778.22	18.3896	19.9898	0.9652	18.3134	18.9992	0.6858	5.969	-19.3294	-13.462
3720	1777.686	19.0246	20.6502	1.27	18.3134	18.9992	0.635	5.9436	-19.304	-13.3858
3750	1778.22	19.8628	21.4122	1.6764	18.288	19.0246	0.635	5.8674	-19.3602	-13.4366
3780	1779.288	21.0058	22.2504	2.286	18.288	18.9484	0.7112	5.969	-19.3548	-13.462
3810	1777.152	21.8948	23.2156	1.778	18.288	18.8976	0.6858	5.9944	-19.3294	-13.3858
3840	1777.686	23.1394	24.511	2.4892	18.2626	18.8976	0.6858	5.9436	-19.304	-13.4366
3870	1779.288	25.4	26.6954	4.5212	18.1864	18.8976	0.6858	5.9436	-19.304	-13.4112
3900	1777.686	27.7368	29.1592	4.6736	18.2372	18.8976	0.6858	6.0198	-19.3294	-13.462
3930	1780.356	30.2514	31.877	5.0292	18.2372	18.923	0.6858	5.9944	-19.3294	-13.4112
3960	1776.618	33.1724	34.6202	5.842	18.2372	18.9484	0.6858	5.969	-19.3294	-13.4366
3990	1766.472	38.6842	40.3098	11.0236	18.3134	18.9484	0.6858	5.9944	-19.2786	-13.3604

LOAD TEST NO.3 - GROUTED PIPE-PILE

4020	1795.842	84.455	86.8426	91.5416	18.3643	19.1516	0.7366	6.1976	-19.2532	-13.2588
4050	1764.87	91.821	93.6498	14.732	18.7198	19.5326	0.7874	6.3754	-19.2532	-13.3096
4080	1375.584	91.1352	92.4814	1.3716	17.8054	18.6944	0.762	6.1722	-19.2532	-13.3096
4110	1332.33	90.805	91.8718	-0.6604	17.6784	18.5166	0.6858	5.969	-19.2532	-13.2842
4140	1335.334	90.7796	91.8718	-0.0508	17.6276	18.5166	0.6604	5.9944	-19.2532	-13.335
4170	1336.602	90.7796	91.8972	0	17.653	18.5166	0.6858	5.9182	-19.2278	-13.2588
4200	1337.136	90.805	91.9236	0.0508	17.6276	18.5166	0.6858	5.969	-19.2278	-13.2588
4230	1200.966	90.5764	91.6686	-0.4572	17.3736	18.1102	0.635	5.842	-19.2532	-13.2588
4260	896.586	89.0016	90.0176	-3.1496	16.256	17.0434	0.6096	5.4864	-19.2024	-13.2588
4290	888.576	88.7222	90.2208	-0.5588	16.0274	16.9418	0.5588	5.3594	-19.2532	-13.3096
4320	888.576	88.773	90.2716	0.1016	16.002	16.9672	0.6096	5.5118	-19.2278	-13.2588
4350	889.11	88.773	90.297	0	16.002	16.9672	0.6096	5.3594	-19.2532	-13.335
4380	890.178	88.773	90.3224	0	16.002	16.9672	0.5842	5.334	-19.2786	-13.3858
4410	646.674	87.5538	88.8492	-2.4384	15.0876	15.9766	0.5334	4.9276	-19.2532	-13.335
4440	453.9	86.3092	87.8078	-2.4892	14.0716	15.0622	0.508	4.5974	-19.2786	-13.3858
4470	444.822	86.4616	87.376	0.3048	14.0462	14.9352	0.4826	4.5974	-19.2532	-13.335
4500	444.288	86.4616	87.4776	0	13.9954	14.9098	0.5588	4.6228	-19.2532	-13.2588
4530	445.356	86.487	87.6046	0.0508	13.9954	14.8844	0.635	4.699	-19.2532	-13.335
4560	445.356	86.3854	87.4776	-0.2032	13.9192	14.8336	0.4572	4.445	-19.2532	-13.335
4590	1.068	82.0674	83.3428	-8.636	10.5664	12.3444	0.5842	3.8862	-19.2532	-13.3096
4620	-395.16	82.0928	83.4698	0.0508	10.5664	12.2174	0.4572	3.81	-19.2532	-13.335
4650	-397.83	82.0928	83.4698	0	10.541	12.192	0.508	3.81	-19.304	-13.4112
4680	-396.762	82.0928	83.5152	0	10.541	12.1158	0.4826	3.683	-19.304	-13.4112
4710	-398.364	82.0928	83.3882	0	10.541	12.0904	0.508	3.7084	-19.304	-13.3858

TIME(sec) VLOAD(kN) D1(mm) D2(mm) CREEP(mm/min) G1(mm) G2(mm) T1(mm) T2(mm) T3(mm) T4(mm)